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A SYSTEM OF GYNECOLOGY AND OBSTETRICS BY AMERICAN AUTHORS.

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GYNECOLOGY.

VOLUME I.—PART I.

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PREFACE.

IN all departments of science the largest results are to be obtained by division of labor and combination of effort. In Medicine this is especially true, and the favor with which the profession has greeted recent systems of Practice and Surgery, concentrating the experience of leading men on each subject, shows that such a plan of composition is more satisfactory than the effort of a single author to treat exhaustively all the details of an extensive branch of practice. By a careful preliminary survey of the ground, and the assignment of each subdivision to a practitioner who has made it the special subject of study, omissions are avoided, every article is authoritative, and each is treated with the fulness to which its importance entitles it.

Gynecology has now grown to an extent which requires for its thorough treatment this co-operation of representative men; and it is eminently fitting that the science which is in so great a degree of American origin should be thus presented by American practitioners. The labors of the Editor have been principally confined to the selection of contributors and the assignment of subjects, and it is with no little pride that he refers to the list of eminent gentlemen whose co-operation has secured in advance the position which the work must assume as the leading authority on its subject. The common effort has been to render each article not only full and complete, but thoroughly practical, special regard being paid to the needs of the general practitioner as well as to those of the specialist. The responsibility for the views presented rests wholly with the contributors; and if there are occasionally found more or less overlapping and some differences of opinion on certain disputed points, this carries with it the cor-

relative advantage of enabling readers to compare different views and to value them at their worth.

In conclusion, the Editor would express his thanks to the contributors for the courtesy and zeal which have characterized their co-operation, and he would further acknowledge his indebtedness to his predecessors, Drs. Charles S. Ward and Henry D. Nicoll, not only for their preliminary labors, but for the good-will which they have so generously manifested.

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HISTORICAL SKETCH OF AMERICAN GYNECOLOGY.

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As in the case of most nations, so in that of medicine, of whose history it forms a part, the earliest dawnings are traceable to tradition, and in many instances the historian is obliged to go back of authenticated records for the material with which to construct the foundation of his story. In writing a history of American medicine in any of its divisions this difficulty does not, however, present itself, for, like the American people itself, it arises from a foundation laid in centuries of Transatlantic life. While, therefore, in essaying a history of the achievements of American surgeons in the treatment of diseases peculiar to women I am not obliged to analyze aught which is of doubtful authenticity as a basis for a starting-point, it has seemed to me that a brief résumé of the historical facts which form the foundation of gynecology as it exists in America to-day will greatly assist to the clearest conception of the superstructure. The explorations of antiquarians of later years into that which has been hidden by the débris of centuries has, moreover, unearthed so many of the prototypes of modern discoveries that a consideration of the latter could scarcely be held to be complete without a reference to their predecessors in the remote ages.

Gynecology is singularly rich in illustrations of the belief that progress is in the direction of a circle rather than in that of a straight line—"that which hath been is, and that which is shall be;" and many of the brilliant discoveries with which it has been enriched in modern times, and even in America, were really but rediscoveries of discoveries which the mutations of time have effaced from the memories and the records of men.

While the current of gynecology as it has flowed down to us in an ever-widening stream from the past is traceable with definite clearness only to the Greeks, there is evidence that it did not have its origin among that remarkable people, but that it trickled in rivulets, too small for the attention of the great majority of explorers, from the people living on the Nile. That the stream was clearly recognized in the days of Homer and Herodotus is attested in the writings of those immortal

Greeks, who wrote in terms of the highest admiration of the skill and the learning of the physicians of Egypt.

The physicians under the Ptolemies were required to regulate their practice according to certain books, one of which was devoted to diseases peculiar to women. These books were held as sacred, and their authority was thus unquestionable. Doubtless, there existed among a people, evidences of whose greatness have of more recent years been so abundantly revealed, other works on this subject, but Saracen fanaticism in the destruction of the Alexandrian Library with its 600,000 volumes blotted out the story of what Egypt once was, and has left us only to conjecture. When the difference in the language and political complexion of Greece and Egypt is considered in connection with the necessarily limited intercommunication of the two peoples, it is but reasonable to suppose that comparatively little of the learning of the older civilization found its way to Greece, and that such inkling as we have received through the Greeks of the status of Egyptian medicine is very meagre when compared with the actual advancement which obtained.

The destruction of the Alexandrian Library has left the writings of Hippocrates, written about 450 B. C., the oldest extant containing anything like a systematic consideration of the diseases of women. Moses, who was versed in "all the learning of the Egyptians," shows a remarkable familiarity with the sexual peculiarities of women, but he treats of them in their physiology, and interests himself in the hygiene of the genitalia rather than in their diseases.

In the language of Adams, the learned commentator on the works of Hippocrates, "these works furnish the most indubitable proofs that the obstetric art had been cultivated with most extraordinary ability at an early period." In regard to gynecology proper, these works are, however, disappointing to him who has been led to admire and revere the philosopher of Cos through a study of his works on general medicine. Hippocrates advised the use of aromatic fumigations in amenorrhœa, which fumigations he also recommended as a test of fertility in the female. The woman who did not conceive was wrapped in blankets and fumigated from beneath; if the scent passed through her body to the nostrils and mouth, then it was known that she was not unfruitful! While he recognized a causative relation between the uterus and hysteria, he maintained that the movement of the womb toward the head caused pain under the eyes and nose, with abundant and frothy saliva; if it moved toward the hypochondrium, it caused vomiting of an acrid, burning matter; if it moved toward the liver, it caused loss of speech, clenching of the teeth, and a livid skin. The remedies for these various hysterical symptoms were as ludicrous as their etiology. Nulliparæ were held to be more subject to menstrual disorders than women who had borne children, for the veins of the woman who has given birth to a

child carry off the menstrual discharge more readily, because the lochial discharge improves the circulation. The views of the "Father of Medicine" on the treatment of uterine hemorrhage were, however, more sensible. We discover, indeed, in them some of the fundamental principles of the advanced methods of our own day. His knowledge of the relation of sympathy between the uterus and the mammæ is apparent in his instruction to apply a large cupping instrument to the breast as a means of staying uterine hemorrhage. His description of leucorrhœa and the frequent attendant systemic condition is graphic, although his therapy of the affection is crude. The prolapsed uterus, he says, "hangs down like a serotum." It should be well washed with astringent lotions and restored to its place, when the woman must be placed on her back with her legs crossed and tied together. That Hippocrates recognized the fact that a molar pregnancy occurring in an unmarried woman impeached her virtue is evident from his statement that moles are caused by a superabundance of menstrual blood, together with a bad condition of the semen. He gives a clear differential diagnosis between molar and true pregnancy. His description of cancer of the uterus is clear, and his gloomy prognosis in such cases has not been much brightened by the advances made since his day. We recognize in the "phimus" of his day the modern stenosis of the os. He recommends an application containing verdigris for its relief. His remarks on atresia of the vagina and uterus command attention: "Sometimes the vagina becomes obstructed after parturition. I have seen a case where the parts were torn during delivery, causing excoriations, after which the parts became seriously inflamed, so that the lips touched and became united as in wounds. After the subsidence of the inflammation the lips, which had reunited, offered an obstacle to the menstrual discharge, preventing its free exit. It is necessary in such a case to dress the lacerated parts and cause cicatrization, but it is also necessary that the cicatrix be firm and complete, while it is very difficult to secure this result. In the instance of which I speak all the results took place which occur when the menses are suppressed by malformation of the uterus, but the principal pain was felt in the vagina, which the woman found to be occluded. After suitable treatment the menstrual flow was re-established, the woman recovered her health, and afterward bore children. If the case had been neglected, the wound would have increased in size, and a cancer would have been the final result." It is evident that the subject of sterility received much of his attention, and his views concerning the causation of the same are interesting. He held the cause to be one or several of the following:

1. Because the os uteri is turned obliquely from the passage to it.
2. Because the inside of the uterus, being smooth, either naturally or in consequence of cicatrices and ulcers, does not retain the semen.

3. When, owing to the suppression of the menses, any obstruction takes place in the os uteri, it is apt to prevent impregnation. 4. When impregnation does not take place, the veins of the uterus become so engorged with blood that they do not retain the semen; or, on the contrary, the same effect may arise from profuse menstruation, whereby the retentive faculty of the vessels is weakened and a return of the menstrual fluid in too great quantity may wash away the semen. 5. Prolapsus uteri, by rendering the mouth of the uterus hard and callous, prevents impregnation."

Among the Romans there is evidence that the diseases of woman received especial attention. Their knowledge was, however, mainly derived from Greece and Alexandria, their writings revealing none of the originality of thought and boldness of procedure which have always marked progress in this division of medicine. Celsus was a voluminous writer, but it is to be regretted that so much of such parts of his works as treated especially of the diseases of women have been lost as to leave us at best a very disjointed reference to the subject. Enough has, however, been preserved of his writings and of those of Galen to convince us that as early as the first century of the Christian era the speculum, rediscovered by Récamier in 1816, was not unknown; that the vaginal touch was used as a means of diagnosis; and that ulceration of the womb and leucorrhœa in its several varieties had been recognized. In the excavations of Pompeii and Herculaneum, overwhelmed with lava from Mount Vesuvius A. D. 79, and remaining buried for nearly eighteen hundred years, there were found among, other surgical instruments, two specula, such as were probably in common use at the time of the catastrophe.

Following the faint glimmer of light emitted from Rome, we have a period of almost absolute darkness extending over five hundred years, all of such history of the medicine of those years as may have been written having at last become extinct. At the end of this period we find at work in the library at Alexandria one Ætius, a Greek, whom the fame of that wonderful collection had probably attracted from his native land, although the fact that he refers occasionally in his writings to cases occurring under his own eye gives color to the belief that, besides delving in the accumulated lore, he also engaged in the practice of his profession. The writings of Ætius, compilations chiefly from the Alexandrian collection, having fortunately been preserved, we are permitted to know through them something of the status of medicine in Egypt a millennium and a half ago. A study of these writings will open up a wonderful revelation to those who regard gynecology as peculiarly a development of these later times. They consist of four books (*tetrabiblus*), each of which is in turn subdivided into many chapters. The fourth discourse of the

fourth book, containing one hundred and twelve chapters varying in length from a few lines to several pages, is principally devoted to obstetrics and diseases of women. In it the uterine and the ovaries, their structure and function, are described with a degree of exactness which both disproves of the assumption that the ancients were ignorant of physiology, and proves that they possessed instruments for ocular examination of the uterus (their dioptra) and sounds for determining its size in the living subject. The description, too, which is given of the methods in vogue for preventing the legitimate consequences of sexual congress and for inducing abortion proves that the nefarious practices by means of which the female of our day would accomplish the same result are not of modern origin. Latero-version, anteversion, and retroversion of the uterus, and various methods for the relief of these displacements, are discussed, and mention is even made of the sound for correcting malpositions of that organ. Abscess of the uterus was recognized, and the description of the examination for its diagnosis and the methods for its treatment would, barring certain crudities of expression, pass muster even in the light of our more advanced knowledge of uterine ailments and the means of their relief. The treatment, medical and surgical, laid down for pelvic abscess would do no discredit to the modern gynecologist. The relief of stenosis of the os by means of sponge tents is so graphically described as either to compel the belief that the modern discoverer of this use of these devices derived his knowledge from the writings of *Ætius*, or to cause the reader to marvel at the remarkable coincidence. Atresia of the vagina is discussed, and the operation, with instruments therefor, for its relief clearly described.

The next writer in chronological order whose writings are preserved to us is Paul of *Ægina*, between whom and *Ætius* there intervenes a century. This writer has been accorded a prominence which he does not merit. Dr. Adams, the translator of the Sydenham series, has shown him much consideration. A study of his writings in connection with those of *Ætius* reveal him to have been a plagiarist. He was at most a compiler, and his efforts even in this direction fell far short of those of the industrious and able *Ætius*.

Following *Paulus Ægineta* we have a millennium of darkness, the gloom being relieved only by the uncertain glints with which the Saracens sought to make amends for their damnable vandalism in the matter of the Alexandrian Library. But an insuperable obstacle to their progress in the knowledge of the diseases of women presented itself in the Moslem religion, which forbade visual and digital examination of the female genitalia, even under conditions of the most intolerable suffering, by male physicians. The ability of the Saracen physicians, so abundantly illustrated in other departments of medicine, was

therefore forbidden an opportunity of manifesting itself in this, and such knowledge as formed the basis of their unsatisfactory practice in gynecology was derived solely from the writings of the Greeks; and the fact that any treatment of a local nature which might have been deemed necessary must be applied by ignorant midwives caused this branch of medicine to soon fall into desuetude and consequent decay. Of the Arabian writers, Albucasis, in the fourteenth century, alone seems to have given it any considerable attention, and there is internal evidence in his writings that he was a Jew, and was thus not hindered by any religious scruples of his own from pursuing his studies after the manner proscribed by the Moslem religion. He makes an occasional allusion to the speculum, but doubtless the circumstances under which he lived made even his employment of it rare. Although it is apparent from the writings of subsequent authors, and notably Ambrose Paré (1509-90) and Scultetus (1683), that the instrument was not absolutely forgotten, it is nevertheless a fact that for a thousand years prior to its rediscovery (if such it really was) by Récamier (1816) it was practically a lost instrument, and gynecology certainly was during this millennium a lost art.

While, as intimated at the outset, American gynecology, dating from the earliest attention to this branch of medicine by the profession of this country, is continuous with gynecology as we have traced it in outline from its earliest dawn in the Old World, its achievements prior to the renaissance ushered in by Récamier cannot be said to have been of sufficient importance to entitle it to a distinctive national name. It must not be inferred from this that this division of medicine was more neglected on this side the Atlantic than on the other, or that the American woman whose means forbade a visit to the European centres was obliged to suffer from her ailments without having held out to her by native talent as much hope as could be promised abroad. While it may have been true, as charged by Dr. Douglass, that there was in his day (1717) "more danger from the physicians of Boston than from the distemper," this condition of affairs had much improved when the War of Independence was declared. The writings of Joseph Osgood of Andover and Joseph Orne and Augustus Holyoke of Salem evince a knowledge of the diseases of women which was probably quite abreast of that possessed by their European contemporaries. In the year 1790, nine years after its organization, the Medical Society of Massachusetts first published such of the contributions as were presented before that body. Among these publications is found an occasional article on some gynecological subject, but the first which was devoted to a subject unconnected with the puerperal condition was one entitled "The History of a Hemorrhage from a Rupture on the Inside of the Left Labium Pudendi." This was contributed by Dr. Nathaniel W. Appleton of

Boston, and appears in the second part of the first volume of the *Transactions* of the society, issued in the year 1806.

The influence of the teachings of Smellie and Hunter very naturally extended to the profession in the colonies, and abundant evidence of it is found in the reports of cases in such literature of the colonial days as is extant. The causes, however, which operated to the repression of progress in gynecology were operative here as in Europe; and while we believe that the latent energies of the profession of the New World, necessarily thrown quite entirely on its own resources, must in course of time have transcended in their results the achievements of the profession abroad, the struggle inaugurated by the Declaration of Independence diverted those energies into channels which were incompatible with scientific research. For seven long years the struggle for personal and national existence not only forbade the development of the native resources, but it also shut the profession out from the influence of the mysterious awakening from the lethargy of centuries which was going on in Europe. Nor did the cessation of hostilities leave the road to professional progress free and unobstructed. The victory had been achieved, but at a cost of life and energy and treasure which caused a depression from which it required many years to rally. Although the profession of medicine, which has for its object the health of the people—the supreme law—is a very essential factor in national growth, there are other matters which are more immediately pressing in seasons of great national depression—agriculture, manufactures, commerce. For a couple of decades following the close of the war these were held to be of paramount concern, and it was not until the opening of the present century that the profession of this country found itself in a position to devote even a portion of its energies to the special development of any particular division of the whole field of medicine which commanded its attention.

It was a happy coincidence that the profession in America found itself sufficiently recovered from the distractions of war to permit of its placing itself in the line of the movement in gynecology inaugurated by Hunter in England, and stimulated to unprecedented activity by the revival of the speculum by Récamier in France. The comparative leisure and wealth which followed in the wake of the prosperity ensured by the elasticity of our people made it possible for the profession to embrace the opportunity, which, had it presented a decade sooner, would of necessity have been allowed to pass by unimproved. The dawn of the present century found our young men and many of our older practitioners repairing to the mother-country and to the various seats of learning in Europe, and drinking in the spirit of the revival, and bringing it back with them to these shores. Among these young men was one Ephraim McDowell, who was born in Virginia in 1771, and

who moved thence with his father and the rest of the family to settle in Kentucky in the year 1783. Young McDowell was accorded the educational advantages of that early day in that new country. His subsequent writings show that his literary acquirements were not of a much higher order than we could have expected under the unpropitious circumstances. After leaving school he studied medicine for two or three years with a Dr. Humphreys of Staunton, Virginia, a graduate of the University of Edinburgh. When we recall the contempt which the physician educated abroad entertained in those days for American educational institutions, we are not surprised at finding no evidence of McDowell's having attended any lectures in Philadelphia, then the only seat of medical education in this country. At his preceptor's dictation, doubtless, he went to Edinburgh, where during the sessions of 1793 and 1794 he attended lectures in the famous university, then in the zenith of its renown. Not fully satisfied, however, with the regular course of the university on the subject of surgery, he took a private course under Mr. John Bell, a surgeon noted alike for his enthusiasm, his eloquence, his skill, and his hold on the affections of his students. We have no evidence that McDowell ever graduated. Mr. Bell is said to have been an enthusiast on the subject of organic diseases of the ovaries, and to have even discussed the possibility of their successful removal, although never himself venturing to practically demonstrate this possibility. Doubtless, the young Kentuckian resolved while under the spell of his teacher's enthusiasm to undertake what that teacher's timidity, perhaps, kept him from attempting, and he returned to his Western home inspired with the high resolve. He settled in Danville in 1795. Although but twenty-four years of age, the fame of his sojourn at foreign seats of learning, and of the fact that he had studied under John Bell, whose reputation had long before crossed the seas, soon secured for him a large clientèle. Patients soon flocked from all parts of the South-west, and for hundreds of miles around he had the monopoly of the important operations. He had been in practice fourteen years when he was consulted by a Mrs. Crawford, who suffered from a large abdominal tumor which a careful examination convinced McDowell was ovarian. Here was the opportunity, and the man was equal to it. The teachings of Bell had fallen in fruitful soil, and the time of their fruition had arrived. Mrs. Crawford was no ordinary woman, and when McDowell declared to her that her only hope lay in the removal of her tumor, explaining to her the fact that such an operation had never before been undertaken, and admonishing her of the dangers which attended it, the brave woman placed herself unreservedly in the brave man's hands. The consultation was held at Mrs. Crawford's residence, sixty miles from Danville, and Dr. McDowell made it a condition of his operating that his patient come to his home

for the operation. The heroine travelled this distance on horseback, was operated on in December, 1809, she being then forty-seven years of age, and at the end of twenty-five days returned to her home, where she lived for thirty-two more years, during which she enjoyed for the most part excellent health, and died at length in the seventy-ninth year of her age. When we remember the facts that this first operation for the removal of an ovarian tumor was performed before the days of anæsthesia, and that Dr. McDowell had none of the advantages of the trained assistants and perfected instruments which are now deemed so essential to the success of this operation, the courage of the woman and the skill and intelligent daring of the surgeon combine to form a picture which is unique for its grandeur in the annals of surgery.

Dr. McDowell's delay in reporting this case of ovariectomy was in singular contrast with the more commendable practice of these later days. Instead of immediately giving a description of his wonderful case for the benefit of his contemporaries, he waited for seven years, during which time he successfully performed two other ovariectomies. His report of these three cases appeared in the October (1816) issue of the *Eclectic Repository and Analytical Review*. It was a document remarkable for its brevity, that portion of it covering the case which has made his name immortal, and which demonstrated the practicability of a procedure which more than any other has lengthened the average of woman's life and diminished the sum of her sorrow, not occupying more space than a page the size of that on which this sketch appears. The incision was made about three inches from the musculus rectus abdominis on the left side, parallel to the fibres of this muscle, and nine inches in length and extending into the abdomen. The abdominal parietes were found to be very much contused, owing, it was supposed, to the tumor's resting on the horn of the saddle during the journey. A ligature was thrown around the Fallopian tube near the uterus, when the tumor was cut open, and "fifteen pounds of a dirty, gelatinous-looking substance" removed. The sac was afterward amputated at the ligature, and was found to weigh seven pounds and a half. As soon as the external opening was made the intestines rushed out on the table, and so completely was the abdomen filled by the tumor that they could not be replaced during the operation, which was terminated in about twenty-five minutes. The woman was then placed on her left side, so as to permit the blood to escape, after which the external opening was closed with the interrupted suture, leaving out at the lower end of the incision the ligature which surrounded the Fallopian tube. Between every two stitches was put a piece of adhesive plaster, which, by keeping the parts in contact, hastened the healing of the incision. The usual dressing was then applied, the patient put to bed, and placed on a strict antiphlogistic regimen. On visiting her five days after, Dr.

McDowell was astonished to find his patient engaged in making up her bed.

The other two cases occurred in negro women, and the space devoted to the consideration of both of them is less than that taken up by a description of the first operation. The whole report was loosely and carelessly constructed, and poorly calculated to inspire confidence in the author's literary and scientific attainments. Had McDowell been gifted with facility of expression the recognition of his operation would doubtless have been more prompt. At his death, in 1830, it had not yet been looked upon with favor, although he had himself performed it thirteen times in all, with at least eight successes. The report of the first three cases having been sent to Dr. Physick of Philadelphia, "the Father of American Surgery," and at that time the leader of the American profession, it failed to interest him, his opinion of the backwoods surgeon being, probably, largely influenced by the display of his literary ability. The report was also sent to the operator's old preceptor, John Bell, but, owing to that gentleman's ill-health, he was at the time absent on the Continent, and as he died not long afterward at Rome, he never received it. The paper fell into the hands of Mr. Lizars of Edinburgh, by whom it was published in the *Edinburgh Medical and Surgical Journal* in 1824. Mr. Lizars, with the instinct of a true surgeon, detected its merit, and was the first to perform McDowell's operation in Great Britain. This recognition of the Kentucky surgeon by his eminent Edinburgh contemporary won for the prophet and his operation an honor in his own country which he had previously been denied.

Dr. McDowell when he operated on Mrs. Crawford had a reputation which was only local, or he was at least known within but comparatively circumscribed limits from his own home. His name did not appear on the list of the great surgeons of his day, and—such is one of the peculiarities of human nature—when it was discovered that his claims did not deserve the ridicule with which they were greeted even in quarters in which one would suppose they would at least have received respectful attention, if not indorsement, envy began to take the place of ridicule. Accordingly, efforts were soon made to rob him of the honor of his great accomplishment, and claims were set up for a number who were alleged to have previously performed the operation.

It is scarcely necessary in this place to review the nature of these claims or to discuss their validity. Suffice it to say that they were all carefully investigated by the late Dr. Samuel D. Gross, and by him pronounced untenable.

While the operation by McDowell marked an era in gynecology, two years before he performed it an American, Dr. John Stearns of Saratoga county, New York, had given to medicine the drug ergot, which was destined to become one of the most important agents in both

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gynecology and midwifery. It is true the drug had long before been empirically employed by European midwives, but Dr. Stearns was the first to reclaim it from such unscientific use by discovering its *modus operandi*. The publication of his paper in the *New York Medical Repository* in 1807 at once gave the drug a place in the physician's armamentarium, and its judicious employment since then has been the means of relieving perhaps as large a percentage of woman's suffering as any one surgical procedure.

The next in chronological order to McDowell who undertook to remove an ovarian tumor in this country was Dr. Nathan Smith of Yale, who, it is claimed, was not at the time aware of McDowell's achievement. His first operation was performed on July 5, 1821, and was successful, the patient being able to walk about in three weeks.

On May 23, 1823, Dr. Alban G. Smith of Danville, Ky., successfully removed an ovarian tumor from a negress thirty years of age. Dr. Smith had made a previous but unsuccessful ovariectomy in 1818. Following this last successful case a number of unsuccessful attempts were made by other surgeons, who in cutting down to the tumor found the adhesions so extensive as to deter them from further attempt at removal of the growth.

The fourth successful ovariectomist of this country was Dr. David L. Rogers of New York, who performed the operation on September 24, 1829. The operation lasted two hours, and at the end of two weeks the patient was able to be up and about her room.

In November, 1830, Dr. J. C. Warren of Boston made an unsuccessful attempt at the removal of an ovarian tumor. In December, 1835, Dr. J. Billinger performed a successful operation, following which there are no records of any cases until 1843, when Dr. A. Dunlap had his first case, an unsuccessful one. In the same year Dr. J. L. Atlee successfully performed a double ovariectomy. In 1844, Dr. Washington L. Atlee, who did more than any other American surgeon to establish ovariectomy as a legitimate surgical procedure, had his first case, which terminated unsuccessfully. Dr. Atlee took a decided stand in favor of the legitimacy of the operation, and, although he encountered a number of unsuccessful cases, he faithfully reported them in detail as a guide to those who might be induced to study the operation with a view to removing from it the discoverable reasons for its mortality. He encountered violent opposition and much vituperation, but had the satisfaction of living to witness such a general recognition of ovariectomy as a legitimate surgical procedure that scarcely any surgeon felt deterred from performing it. In 1855 he published a synopsis of his first thirty cases, of which seventeen recovered and thirteen died. Such a percentage of recoveries from a disease in itself necessarily fatal silenced opposition to the operation, and from that time the number

of ovariologists in this country has rapidly increased, even up to the present time, while the percentage of mortality attending the operation by competent operators has, under improved methods, antiseptic and mechanical, grown to be quite as small as that attending most other capital operations.

In 1853, Dr. Washington L. Atlee read before the American Medical Association a paper on fibrous tumors of the uterus which at once became a portion of the classic gynecological literature of this country. It dealt with such of these tumors as had heretofore been supposed to be inaccessible to the knife or not amenable to curative measures. The paper was based wholly on the author's own experience, and gave important information touching the classification and means of diagnosing these tumors, besides indicating a method of their treatment by enucleation. It divided them into—1, extra-uterine or surface tumors; 2, intra-uterine or cavity tumors; and 3, intramural tumors of the uterus. The value of ergot given internally as a remedy was strongly insisted on, and the use of that drug in the removal of these growths through absorption due to pressure from contraction of the non-striated muscular tissue has since been regarded as the most efficacious means of treating such growths as are inaccessible to the knife.

In 1856 there appeared the prize essay by Dr. George H. Lyman of Boston upon the *History and Statistics of Ovariectomy, and the Circumstances under which this Operation may be regarded Safe and Expedient*. Up to that date Dr. Lyman's monograph was, probably, the most complete of any that had appeared, being a complete and careful research of the ovariectomy statistics of all countries.

In the same year Dr. I. E. Taylor advocated a new operation for the cure of recto-vaginal fistula, reporting two cases in which he had successfully employed it. This operation consisted in the severing of the sphincter ani in such cases.

Some remarkable operations for the removal of the extra-uterine fetus were performed in the early history of this country. In 1791, Dr. William Boynham of Virginia successfully removed the tumor by incision of the abdominal parietes. In 1799 he performed a similar operation, and with equally satisfactory results. In 1816, Dr. John King of South Carolina cut through the walls of the vagina and removed through the incision, by means of the forceps and abdominal pressure, a living child which had been carried through the full term of gestation in the abdominal cavity outside the uterus. The life of the mother was also saved. This case stands on record as one of the most remarkable ever encountered, and, being without precedent, does all the greater credit to the operator's judgment and resolution. In 1874, Dr. T. Gaillard Thomas incised the vaginal wall with the galvano-caustic knife and removed a three months' fetus; and in 1875,

Dr. D. Hayes Agnew of Philadelphia reported a case of vaginal section performed by himself for the removal of an extra-uterine foetus.

Simon's method of introducing the hand into the rectum for diagnostic and therapeutic purposes is not as new as many are disposed to believe. In 1806, Dr. Clark, an American, recorded the fact that he introduced his hand into the bowel, and, putting his finger into the mouth of an extra-uterine foetus, made traction and delivered the head *per rectum*. The body and secundines were removed spontaneously some time after. On the next day the anus had contracted to its natural size, but on the third day it, as well as the perineum, began to slough. On the ninth day the parts had commenced to heal, but the fourchette was destroyed.

Although such records as are available show that American surgeons and general practitioners were quite as successful in their treatment of special diseases of the womb as were their contemporaries abroad, nearly half a century had gone by since McDowell's discovery before anything occurred on this side of the Atlantic of a nature calculated to direct special attention to American gynecology. But the native shrewdness of the American practitioner qualified him for such utilization of existing knowledge as made him the peer of his Transatlantic brother in this special direction. Not until the year 1852, however—if we except Meigs's discovery of cardiac thrombosis as a cause of sudden death in childbed, and Hodge's improvements in the construction of uterine pessaries—did any of the great Kentuckian's countrymen do aught worthy of giving them marked distinction in the direction of gynecology. Hodge's pessary was a very decided improvement on instruments heretofore constructed for a similar purpose, being based on more correct physiological principles than any of its predecessors. The description of the steps which more immediately preceded the discovery of this pessary is best given in Dr. Hodge's own words, as quoted in a commemorative address by Dr. Penrose of Philadelphia: "He had been contemplating for a long time the subject of new shapes for pessaries, and after many experiments had found nothing satisfactory. One evening while sitting alone in the room where the meetings of the medical faculty of the university were held his eyes rested on an upright steel support by the fireplace designed to hold the shovel and tongs. The shovel and tongs were kept in position by a steel hook, and as he surveyed the supporting curve of this hook the longed-for illumination came: the shape, apparently so paradoxical, revealed itself in the clear light and flickering volume of the burning grate, and the Hodge lever pessary was the result." This was in the year 1830. To him the profession is indebted for the origin and development of two ideas which are at this day considered among the most important facts in uterine pathology—namely, that the condition of the uterus characterized by

enlargement, displacement, congestion, hypersecretion, and tenderness is not inflammation, nor should it be treated as such—that sustaining the uterus, and thus affording an easy and natural means of overcoming congestion and its results, is a prime factor in their relief and cure.

In 1833, Dr. Walter Channing, professor of obstetrics at Harvard University, wrote an article on “Irritable Uterus.” This was the first comprehensive monograph upon a purely gynecological subject in New England, besides being one of the most valuable contributions extant to this division of medicine.

In 1841, Dr. Gunning S. Bedford, one of the most graceful writers of any age, established the first clinic for diseases of women ever held on this side the Atlantic, in connection with his chair of obstetrics in the University Medical College of New York. In this year also Dr. Alonzo Clark of New York introduced his plan of treating peritonitis with large doses of opium. This plan involves the exhibition of the drug to the limit of profound narcotism. The amount of it which is tolerated by the patient is greatly in excess of that which he will bear in the physiological condition. It requires the close attention of the physician in order that the limit be not inadvertently exceeded.

In 1844, Dr. J. C. Nott of Mobile, Alabama, published a report of a case of the removal of a carious coccyx, which was followed by relief of a very aggravated coccygodynia.

During the year 1852 there appeared in the *American Journal of Medical Sciences* an article by an Alabama doctor which once more directed the eyes of the medical world to this country. If Récamier’s resurrection of the speculum marked the rise of modern gynecology, this article caused it to take a stride unprecedented. Récamier’s speculum had exposed the uterus, but it did so quite imperfectly, and was of little or no service in placing the vagina under surgical control. The writer of the paper referred to had solved the problem, and the surgical diseases of the approach to the womb became amenable to treatment, while affections of the womb itself ceased very largely to be the opprobria of the healing art. If McDowell’s discovery “has added forty thousand years to the sum of human life,” who can compute the sum of happiness to the mind and misery averted through this discovery by J. Marion Sims? The paper by him on vesico-vaginal fistula made his title of “Father of American Gynecology” indisputable, and the discovery which it recorded has made surgery of the uterus and vagina a wellnigh exact science. The discovery of the operation for the cure of a disease previously incurable was in itself a great achievement, but the discovery of a method of so distending the vagina by air as to render this operation and all other necessary operations on the vagina and womb possible was a greater achievement. Gynecology to-day would scarcely deserve the name of a separate branch of medicine but

for Sims's discovery. It has been appropriately said that "it has been to diseases of the womb what the printing-press is to civilization, what the compass is to the mariner, what steam is to navigation, what the telescope is to astronomy; and grander than the telescope, because it was the work of one man."

While the grand results to gynecology which the genius of Sims has evolved are the outcome of that careful study and constant effort which are the essentials to most of such results in science as are destined to live, the discovery of the fact which brought his mind in the line of work which made him famous was quite purely accidental. Singular as it may appear, his tastes were originally not for gynecological work: he was, indeed, quite averse to treating diseases of the female sexual apparatus, and even to the necessary means of examination for making a diagnosis of such affections. He had, after perhaps more than the usual share of vicissitudes and discouragements which beset the young practitioner, and extending through an unusual length of time, succeeded in gaining the confidence of the community in which he lived and in establishing a reputation as a general surgeon. He was one day called in consultation in a case of labor in which the head had been impacted for nearly three days. He delivered the woman quite readily with the forceps, and she rallied well from the operation. Five days later she was, however, discovered to have an extensive slough of the soft parts, and was discharging both urine and feces through the vagina. He had then been in practice ten years, and this was the first case of vesico-vaginal fistula which he had encountered. After consulting the literature on the subject, he was convinced of the very rebellious nature of the accident to treatment, and in spite of the importunities of the owner of the woman (who was a slave), he refused to undertake an operation for its relief. In one month from that time he was consulted in reference to a vesico-vaginal fistula existing in the case of another negro slave, and again, in about another month, a third case came under his notice. This unusual number of cases presenting within such a short time compelled his attention to the disease, and, as he had established a small hospital, the three cases were placed under his care in the hope that he might devise some means of relief. While perplexed with these cases he was one morning suddenly called to see a lady who had been thrown from her horse. After due examination he concluded that the distressing pain from which the woman suffered was caused by a dislocation of the uterus. Recalling a rule for the treatment of this accident which had been given him while a student, he placed the patient on her knees and elbows, and, introducing one finger into the rectum and another into the vagina, "pushed up and pulled down" according to directions. Finding that he could just reach the uterus with his index finger, which was not long enough to permit him

to exert any force on the organ, he introduced also the middle finger; and in his effort to push the uterus back turned his hand palm upward and then downward, when all at once he could feel neither the womb nor the walls of the vagina. Immediately the woman declared she was relieved. As she turned on her side there was a sudden explosion, as though of air escaping from the bowel. He was satisfied, however, that the air was not from this source, but was from the vagina, and concluded that his traction on the perineum had suddenly created a vacuum into which the air rushed and expanded the vagina to its fullest capacity. Fired with a new idea which had just been forced upon him, he hurried home in order to test it in the case of the unfortunates suffering from vesico-vaginal fistula in his hospital. On his way he had stopped and bought a large pewter spoon, which he bent so as to secure the necessary purchase for retracting the perineum, as he had discovered he had accidentally done in the case of the woman suffering from the dislocation of the womb. Selecting one of his patients, he placed her on a table in the genu-pectoral position, and, placing a student on each side, instructed them to lay hold of the nates and pull them open. Before he could get the bent spoon-handle into the vagina the air rushed in with a puffing noise, dilating the cavity to its fullest extent. On making further traction with the spoon he had revealed to him a sight which had never before been seen by any man. The fistula with its edges clearly defined was plainly visible; the wall of the vagina could be seen closing in every direction; the neck of the uterus was distinct and well defined, and even the secretions therefrom could be plainly seen.

He at once devised and had made for him the instruments which he considered to be necessary for closing up the fistula. Among these instruments was the duck-bill speculum, to which his name has been inseparably attached; and it is a singular fact that the original design of that instrument has never been altered. It took him three months to have the necessary instruments made, and the case which he selected for the operation was an unusually bad one, the whole base of the bladder being destroyed, leaving an opening between the vagina and that viscus at least two inches in diameter. This was in December, 1845, and before the discovery of anæsthesia. He succeeded in closing the fistula in about an hour's time. In order to prevent the urine from dripping through into the vagina, he placed a piece of sponge in the neck of the bladder, through which he ran a silk string which he hoped would act as a capillary tube that would serve to turn the course of the urine from the fistula. This latter device proved to be a very unfortunate one. At the end of five days the patient was very ill from what, in more recent times, has come to be known as blood-poisoning. On attempting to remove the sponge, he found that it had

become solidified with sabulous matter from the urine, and he had great difficulty in removing it. On examining the fistula, he found that it had disappeared with the exception of two small openings in the line of the union of its edges. Encouraged by this pronounced success in healing the opening, he was confident that the small remaining apertures could be closed by a subsequent operation; before performing which, however, he operated on another of his patients, using in this case a self-retaining catheter instead of the sponge. At the end of seven days he removed the sutures, but discovered that though the original fistula had been greatly changed in character, there still remained three little openings through which the urine escaped. In spite of the repeated operations, having operated some thirty times on one of the cases, extending through a period of three years, he found himself unable to effect a complete closure of the fistula in any case. He finally concluded that he should not perform another operation until he had discovered some method of trying the suture higher up in the body than he could reach. While lying in bed one night the idea occurred to him to run a perforated shot along the suture to the edge of the fistula, and when it was drawn tight to compress it with a pair of forceps, thus making the knot perfectly secure. Elated with this idea, he conducted further operations, but with scarcely any better success than heretofore. He was now convinced that the cause of the failure lay in the nature of the material employed for sutures—namely, silk thread—and his next object was to secure some substitute. Mat-tauer of Virginia had employed lead, and Sims had tried this material as a suture in his cases of vesico-vaginal fistula, and had failed. At this juncture, in walking from his house to his office one day, he picked up a little piece of wire. Taking this to a jeweller, it served as a pattern for some pure silver wire which he ordered. In the next operation the edges of the womb were denuded and brought together with four sutures of wire thus prepared, the suture being closed by means of the shot run upon the wire and pressed with the forceps when run sufficiently far up. In using silk sutures cystitis always resulted in the case of operations at the base of the bladder, the urethra being always swollen and the urine loaded with thick, ropy mucus. With the use of the silver suture there was a complete change in these conditions. After a week had passed the patient was removed from the bed and placed upon an operating-table, and with an anxious heart the result of the use of the wire suture was examined. There lay the suture apparatus just exactly as it had been placed, with no inflammation, no tumefaction, and perfect union of the fistula. At last the labors of three years had been crowned with success, and vesico-vaginal fistula was removed from the list of incurable affections. In the course of two weeks the remaining patients in the hospital were

operated on, and in every case the results were completely satisfactory.

While it is manifestly the duty of the historian to select for his narrative, without bias or favor, facts which he regards as the most indisputable, he ought not to be accused of exceeding his duty when he notices claims which, although not disposed to concede them, he may regard as entitled to respectful consideration. The name of Sims will live in the history of medicine as that of the father of American gynecology, but it is only just to state that the claims of priority for some at least of the achievements which have won him this proud title have been disputed. Among those who have contested these claims, his contemporary, Dr. Nathan Bozeman, has been prominent. He was associated with Sims in the early years of their practice, and became his successor at Montgomery, Alabama, on Sims's removal to New York. Unfortunately, a dispute as to the authorship of several of the devices, which have made the operation for vesico-vaginal fistula a success, developed in later years, and became tainted with a considerable degree of acrimony. With this dispute we have nothing to do, further than to state that while history will endorse Sims's right to all that he claims in connection with the discovery and perfection of the operation, it will not deny to Bozeman an important part in helping to establish the foundation on which American gynecology is erected. Dr. Bozeman subsequently followed Dr. Sims to New York. Among the discoveries with which his name will continue to be associated are his knee-chest support, his self-retaining speculum, his button sutures—instruments and methods now but little used; also his method of autoplasty by gradual approaches, and his operation for the cure of chronic cystitis through the establishment of a fistula leading into the vagina. This operation was also independently discovered in the same year by Dr. T. A. Emmet, who was the first to give it to the profession in 1868, Dr. Bozeman's paper not having been published until 1871.

Dr. Sims's achievements, on which what may be called American gynecology is founded, were wrought out in an obscure Southern town and while engaged in the commonplace duties of the country general practitioner. With no prestige of college connection, and none of the backing which is generally considered necessary to distinction in a specialty, he won for himself the proud distinction, "Father of American Gynecology." It was necessary, however, after having thus laid this essential foundation that it should become known to the profession. To this end Dr. Sims determined to repair to one of the medical centres, and this the precarious state of his health compelled him to do sooner than he would have otherwise done. Being the victim of a chronic diarrhœa, his complaint made it necessary for him in 1853 to remove from the scenes of his distinguished labors, and he

decided on New York as his future home. The story of his earlier years in that city furnishes us a singular illustration of the jealousy of the obscure practitioner on the part of the gentlemen connected with the medical schools. An apparently systematic effort was made to appropriate his work without credit, and the attempts of certain individuals in this direction reflect little credit on their memory. After encountering opposition and suffering discouragements to which even he, with all his enthusiasm and force of character, would have succumbed but for the support and cheer of an heroic wife, he was thrown in the way of a Mr. Henri L. Stuart, who, being a man of great influence in both the financial and social world, and becoming warmly interested in the object of Dr. Sims's ambition—namely, the establishment of a woman's hospital—entered heartily into the project. At Mr. Stuart's suggestion, Dr. Sims sent out notices to the general profession that he would, on a certain day in May, 1854, deliver a lecture in which he would call the attention of all who might attend to the work which he had done. In view of the treatment which he had received at the hands of the gentlemen on whom he had called personally, he was very much encouraged at the size of the audience which had responded to his invitation. In spite of his innate diffidence, he succeeded in not only interesting the meeting, but in arousing it to a very considerable degree of enthusiasm. The plan of establishing a woman's hospital was broached, and, largely through the influence of Mr. Stuart, the project found favor with the public, and many prominent ladies of the city became actively interested in the work. These ladies formed themselves into an association, and in 1855 the object of Dr. Sims's ambition was realized—the woman's hospital had become a fact. It received very little encouragement from the leaders; that is, the hospital-men. Dr. Sims was called by them a quack and a humbug, and the hospital was pronounced a fraud. But in spite of the formidable opposition from this source the work went on, the wards of the institution were opened to any doctor who cared to come, the operations were performed in the presence of leading medical men, and the profession generally was welcomed to the institution. The hospital was inaugurated on the 1st of May, 1855, at 83 Madison Avenue, shortly after which Dr. Sims associated with himself Dr. Thomas Addis Emmet, who was at that time a young man and unknown, but who has since won for himself a reputation in gynecology second only to that of Sims himself. The woman's hospital in 1857 secured a charter from the State, and has from that time been known as "The Woman's Hospital of the State of New York." This institution has been the most important factor in the progress of American gynecology. Here it was that a systematic method of treating the diseases peculiar to women was first adopted. Until Sims's connection with it gynecology

as a specialty was unknown, he being the first to give attention to it, to the exclusion of all affections not coming distinctively under its head. Under his direction the facilities afforded by the Woman's Hospital were utilized to the perfection of operations on the perineum, vagina, and uterus, which previous to his immortal discoveries had been unknown, but which, chiefly through the knowledge disseminated from that centre, are now daily performed by even general practitioners in all parts of the world, to the relief of untold suffering.

In 1861, Dr. Sims visited Europe. His reputation had preceded him, and his reception both by the profession and the public was in keeping, and he soon found himself with such a large clientèle, in nearly all of the European medical centres that he afterward devoted his time about equally between both sides of the Atlantic. In 1865 he published his *Clinical Notes on Uterine Surgery*, in which he embodied the results of his special work, describing the operations which he had devised and the improvements which he had made on the procedures hitherto in vogue. This work made a very profound impression on the professional mind, and it was soon translated into almost all modern tongues. It was, indeed, the most distinctive work on gynecology which had been published, and may be said to be the basis of the specialty of gynecology as it exists to-day. Written in a style calculated to carry conviction, it at once became the guide and gave impetus to gynecological study.

On Dr. Sims's retirement from the Woman's Hospital in 1862, Dr. T. Addis Emmet became surgeon-in-chief, and under his charge the institution continued to grow both in popularity and usefulness. Following the impetus given by Sims to gynecology as a specialty, a number of American surgeons gave their attention exclusively to this branch of work, and among those who at an early date thus devoted themselves Thomas Addis Emmet, H. R. Storer, Nathan Bozeman, E. R. Peaslee, T. Gaillard Thomas, James P. White, W. H. Byford, William Goodell, and Robert Battey have attained marked distinction, and American gynecology bears the indelible marks of their labors. Some of these gentlemen are dead, and to write of them in terms of the enthusiasm which their valuable work naturally arouses in a contemporary who has closely watched their progress might be in keeping. It is, however, a delicate and very difficult task to write of the living, and it must remain for a future historian to express out of the fulness of his heart his estimate of those who, having done their life-work in this direction, are now in the sere and yellow leaf. A bare record of their work is all that is now permissible.

Dr. Emmet in 1859 withdrew from general practice, and has since devoted himself exclusively to gynecology. He has been a diligent worker in the field, and has contributed freely to medical periodicals

reports of the results he has achieved. The most notable of his contributions pertain to the subject of laceration of the cervix uteri, detailing the etiology of the affection, its symptoms, its effects on the constitution, and the operation for its relief. This operation is now distinctively known as "Emmet's operation." It was first described in 1869 in a paper read before the Medical Society of the County of New York, and published in the February number (1869) of the *American Journal of Obstetrics*. In 1874 he presented before the same society an article on lacerations of the cervix uteri as a frequent and unrecognized cause of disease. The writer, not wishing to anticipate the events of later years, must dismiss this subject here, but will allude to it at some length when writing of the occurrences of the last-mentioned year.

In 1854, Dr. E. R. Peaslee made a valuable contribution to the treatment of septicæmia following ovariectomy. His method consisted in the introduction of a tube into the peritoneal cavity, through which the serous sac was freely washed out. Experience with this new method has done much to remove the fear which was before entertained of interference with the peritoneal membrane. After the lapse of a third of a century this method still remains as the most reliable for the treatment of one of the gravest consequences to the operation for the removal of ovarian tumors. In one of Peaslee's cases, reported at the time of his introduction of this new method, intraperitoneal injections were kept up for fifty-nine days, and in another for seventy-eight days, recovery following in each case.

In 1856, Sims added another to his long list of brilliant achievements by publishing his operation for narrowing the vagina as a means of curing prolapsus of the uterus. This advice was not strictly original with him, although we have no evidence to show that he had imitated any of his predecessors. The operation had been performed in Europe many years previously, but had fallen into desuetude.

Dr. James P. White of Buffalo during the same year reported the successful reduction by taxis of an inverted uterus of eight days' standing: Dr. White was a pioneer in taking the position that chronic inversion of the uterus is, as a rule, *always reducible*. He is distinguished as the first successful operator in the country to reduce a *chronic* inverted uterus. E. Noeggerath in 1862 practised reduction of inverted uteri by digital compression of both horns; and in 1868, Dr. T. Addis Emmet reported that he had retained partial reposition of the organ by closing the os externum with silver sutures. By means of this operation the advance made at one sitting is not lost, and the case is thus all the better prepared for future effort.

In 1861, Sims described the disease known as vaginismus, and recommended, as a means for its relief, the removal of the remains of the hymen and the section of the tissues at the perineal extremity of the

ostium vaginae. This affection had been previously known to European authorities, and forcible distension of the ostium vaginae, together with alterative applications with a view to the modification of the local nervous hyperæsthesia, recommended for its relief. The operation proposed by Dr. Sims was, however, an advance on the latter.

Prior to 1862 but one case of pelvic hæmatocele had been published. In this year this subject was brought prominently to the notice of the profession by the appearance of three essays, written respectively by John Byrne of Brooklyn, Fordyce Barker and Emil Noeggerath of New York.

In 1866 appeared an excellent treatise on "Vesico-vaginal Fistula," by M. Schuppert of New Orleans. It contained the history and exhaustive summary of the operation, was illustrated, and embodied the extensive experience of a successful operator in this department of surgery.

Dr. Theophilus Parvin reported in 1867 a case of uretro-vaginal fistula in which he operated by turning the displaced distal extremity of the ureter into the bladder, and then closing the vaginal opening. The operation proved entirely successful, and was original with Dr. Parvin.

In 1869, H. R. Storer published a "Method of Exploring and Operating upon the Female Rectum by Eversion of the Anterior Rectal Wall by a Finger in the Vagina." Since then this "method" has been quite generally adopted by gynecologists in certain cases.

In the same year V. A. Taliaferro of Georgia published an essay on "Pathological Sympathies of the Uterus," which attracted some attention.

In 1869, Dr. Julius F. Miner of Buffalo recommended, as an improvement in the management of the pedicle after the removal of an ovarian tumor, the stripping off from the tumor the expansion of the pedicle instead of ligating and severing it. This mode of treating the pedicle was called by Miner "enucleating the pedicle." This method is applicable in many cases, and when it can be applied is much to be preferred to the ordinary methods of securing the pedicle by clamp or ligature.

In 1870, Dr. T. Gaillard Thomas of New York removed an ovarian cyst of the size of a large orange through an opening made through the vagina and the cul-de-sac of Douglas. This was the first time that this procedure had been deliberately adopted for this purpose. It has been successfully practised since by Dr. Davis of Pennsylvania, Dr. Gilmour of Alabama, Dr. Battey of Georgia, and others. In the same year an important contribution to the current gynecological literature appeared from the ready pen of H. R. Storer entitled "Anal Fissure in Women." In the same year appeared an article entitled "Sudden Enlargement of

Ovarian Cysts from Hemorrhage into them," by the late brilliant and lamented John S. Parry, who afterward (1876) wrote so learnedly and exhaustively on "Extra-uterine Pregnancy." Dr. F. D. Lente has made many valuable contributions to gynecological literature, his principal article being "Intra-uterine Medication" (1870), of which he was a prominent advocate. Lente's silver probe and platinum eup were devised for the purpose of applying fusible substances, more particularly nitrate of silver, to the uterine cavity. His method was a marked improvement upon many of the other modes of intra-uterine medication. It was considered very valuable when caustics were more freely and more frequently used within the cavity of the uterus than is customary at the present time.

In 1871, through the energetic efforts of Dr. A. Reeves Jackson, the Woman's Hospital of the State of Illinois was founded. For a number of years he was the surgeon-in-chief, but latterly a full staff of medical officers has been in charge. Dr. M. S. Buttles claims to have been the first (1871) to apply the actual cautery to the uterine cavity in the treatment of submucous fibroids, and to be, therefore, the originator of that operation.

In 1872, Dr. Robert Battey of Atlanta, Ga., reported a case of extirpation of the ovaries, the results of which justified him in recommending this operation for the relief of dysmenorrhœa due to imperfect ovulation and accompanied by an excessive menstrual molimen, the object of the operation being to establish at once the change of life, and thus prove an effectual remedy for diseases otherwise incurable and dependent upon ovarian irritation. He termed the operation "normal ovariectomy." This name is not strictly applicable, inasmuch as it implies a normal condition of the ovaries, and is thus nothing more or less than spaying—an operation which has been practised from time immemorial for the production of sterility. The important points connected with this subject are best described in Dr. Battey's own words: "I have operated in widely different circumstances. In one case the patient had amenorrhœa, convulsions, recurrent hæmatocele, repeated pelvic abscesses, incipient tuberculosis from pulmonary congestion, etc. Several of the cases passed under the head of ovarian neuralgia; several had intractable dysmenorrhœa with pelvic deposits of old lymph; one had ovarian insanity, etc. All had exhausted the available resources to no useful purpose. I operate upon no case that any other respectable medical man proposes to cure. In most of my cases the full results of the operation have not yet been developed. This is the work of many months, and sometimes two or three years are necessary to its full and perfect realization. In no case has the patient failed to realize such a degree of relief and benefit following the operation as to amply compensate her for the pains and dangers incident thereto, to say

nothing of the promise of full and ample recovery at the completion of the physiological change. In two of my cases this change has seemed to occur at once in all its completeness, but it is always my expectation that it will occur gradually, extending through two or even three years to its final completion. In my first case, now nearly three years ago, the restoration to health is eminently satisfactory. It is true that she is not absolutely and perfectly well, but she is fully relieved of the convulsions, the ovarian periodical congestions, the hæmatocœles, the pelvic abscesses, etc. for which I operated. I submit the question in all sincerity: If I confine myself to cases where life is in danger or where health and happiness are destroyed—cases which are utterly hopeless of other remedy this side of the grave—ought the profession to demand at my hands the restoration of these forlorn invalids to complete and absolute health in every particular?"

The operation was originally performed by Dr. Battey in most cases with the patient on the left side and by the aid of Sims's speculum. "The cervix was drawn down to the pubes by means of a strong hook, where it was held while Douglas's cul-de-sac was opened from the vagina by means of a pair of scissors. On reaching the ovary with the finger as a guide it was seized by forceps or tenaculum and drawn into the vagina. It was then separated by the *écraseur*, or, being secured by a silk ligature, it was cut off and the stump returned into the cavity, the opening being left to close gradually, so as to admit of drainage." Dr. Battey does not, however, confine himself to this method of operation, but removes the ovaries by abdominal section as well. Battey's operation has been successfully performed by a number of practitioners since his introduction of it, and a sufficient time has now elapsed to permit a just estimate of its merits; and there no longer remains any doubt as to the propriety of its performance in cases which have resisted all other means of treatment. The principal danger consists in its performance at the hands of unskilled persons, and in the improper selection of cases, which is very apt to occur in the practice of those of limited experience in the treatment of diseases peculiar to women. Dr. Sims's inferences from his experience in the performance of the operation are as follows, and they are generally endorsed by those qualified to pass an opinion: "1st. Remove both ovaries in every case; 2d. As a rule operate by abdominal section, because if the ovaries are bound down by adhesions it is possible to remove them entire, whereas by vaginal incision it is not possible; 3d. If we are sure that there has been no pelvic inflammation, no cellulitis, no hæmatocœle, no adhesions of the ovaries to the neighboring parts, then the operation may be made through the vagina or otherwise." Dr. Goodell of Philadelphia formerly preferred the vaginal method, and if he found it impossible to remove the ovaries in that direction on account of adhesions or other causes, he

would resort to the abdominal section, leaving the vaginal incision for deep drainage. The timely warning of the experienced gynecologist who originated it must never be forgotten by those who essay the procedure. Dr. Emmet would limit the operation to the extirpation of both ovaries for the arrest of hemorrhage from a fibrous tumor and in cases of threatened insanity, epilepsy, or phthisis. For nervous disturbances which present more of the hysterical element he maintains that the operation should never be thought of. The operation, he thinks, may be more frequently necessary in the present generation than it ought to be in the future, since a large number of cases calling for it have, under injudicious management, been already rendered incurable by other means. He holds that in the future this ought not to be so, for our enlarged opportunities for acquiring skill in the treatment of uterine and ovarian diseases ought to enable us to raise our patients above the necessity of such a terrible ordeal. This operation has of late come into very general use, and has been performed by many operators both at home and abroad.

During the year 1873 was published the eminently practical treatise of Dr. D. Hayes Agnew of Philadelphia on "Laceration of the Female Perineum and Vesico-vaginal Fistula, History and Treatment." The profession is much indebted to this author for his earnest and valuable labors in the branches of surgery of which this volume treats.

In the year above mentioned was published by the Government a quarto volume entitled *A Report of the Columbia Hospital for Women*. This was written by Dr. J. H. Thompson, the surgeon-in-chief of the hospital. The book was very widely distributed throughout the country. It contains much valuable matter, but it encountered a great deal of adverse criticism on the part of medical editors and reviewers following its publication.

In 1873, Dr. John Ball of Brooklyn described a plan of treating constrictions and irregularities of the canal of the cervix uteri from flexions and versions by rapid dilatation by expanding instruments of steel. His method is to first evacuate the bowels very thoroughly, so as to prevent all effort in that direction for two or three days. The patient is then placed on her back with her hips near the edge of the bed and profoundly anesthetized. A three-bladed, self-retaining speculum is introduced to bring the os uteri into full view. The os is then seized with a double-hook tenaculum and drawn toward the vulva, when an ample bougie, as large as the canal will admit, is introduced, and followed in rapid succession by others until the canal is dilated to admit of a No. 7, which represents the size of his dilator. With this instrument the cervix is stretched in every direction until it is enlarged sufficiently to admit of a No. 16 bougie. A hollow gum-elastic uterine pessary of that size is then introduced, and retained in position by a

stem secured outside of the vulva for about a week, in which time it will have done its work and is ready to be removed. The patient during this time is kept perfectly quiet, usually upon her back, which is generally found to be the most comfortable position. Out of between twenty and thirty cases in which Dr. Ball had to resort to this procedure he has met with but one fatal issue. Lately, Dr. Goodell of Philadelphia has published a large number of cases operated on by forcible divulsion with very gratifying results. The method has come into very general use.

Early in this year Emmet published an account of the cause of failure and a new mode of operating for complete laceration of the perineum. Heretofore, operators had not taken into account the fact that the muscular fibres of the sphincter retract more than the others. Consequently, only the external fibres were brought together, resulting often in entire or partial failure to restore the retentive powers of the anus, and frequently, while the external parts would be united and the operator thought he had been successful, it was common to find that a fistula resulted. By diagrams and descriptions he showed in his written articles the manner in which the denudation must be made and sutures placed in order to secure apposition of the inner as well as the outer fibres of the sphincter: "If we examine carefully the extremities of the lacerated muscle, we shall find a slight pit or depression at each end which has been caused by contraction of a portion of its fibres. At the commencement of the operation a portion of the tissues at this point must be seized with a tenaculum and removed with a pair of scissors, together with a narrow strip entirely around the laceration to the opposite end of the muscle. After the edges of the muscles have been properly denuded the most important part of the operation is to introduce the first suture in its proper relation to the edges of the divided muscle. The manner in which these sutures should be introduced can only be shown by diagrams, and is not essential in this connection. These sutures are so adjusted that the divided edges of the sphincter are turned up and appear in perfect apposition."

But he also taught the profession the importance of adjusting the sutures in order to make this operation a success; and as a result of the teachings of this distinguished gynecologist his mode of operating in these cases has become generally known, and is now the common property of the profession. In his very latest writings he announces that he has but little to add as the result of further experience to the paper which was published during this year. He states that to unravel the cause of failure in this operation and to devise means of obviating it have occupied his attention for many years, and that they have cost him more thought than he has ever devoted to any other professional subject.

In 1873 also Dr. Thomas M. Drysdale of Philadelphia described a peculiar corpuscle as characteristic of ovarian fluid, and for a time it was believed that a perfect means of diagnosis of the existence of cystic ovarian tumors by microscopical examination of their contents could be determined; but while Dr. Drysdale seems to have been very successful in diagnosing ovarian tumors, others have not been so successful. The late Dr. Atlee attached great importance to this method of Dr. Drysdale's, whose views upon this matter may be summed up in the following words: "I claim, then, that a granular cell has been discovered by me in ovarian fluid which differs in its behavior with acetic acid and ether from any other known granular cell found in the abdominal cavity, and which by means of these reagents can be readily recognized as the cell which has been described; and further, that by the use of the microscope and assisted by these tests we may distinguish the fluid removed from ovarian cysts from other abdominal dropsical fluids."

In this same year (1873) a paper which has been designated as a remarkable one, and which excited much adverse criticism, was published by Joseph R. Beck of Indiana, entitled "How did the Spermatozoa Enter the Uterus?" The patient of the doctor in whom sexual orgasm could be produced by digital examination was the subject upon whom his observations were made, which are reported as follows: "The cervix uteri had been firm, hard, and generally in a normal condition, with the os closed so as not to admit the uterine probe without difficulty; but immediately the os opened to the extent of fully an inch, made five or six successive gasps, drawing the external os into the cervix each time powerfully, and at the same time becoming quite soft to the touch. All these phenomena occurred within the space of twelve seconds' time certainly, and in an instant all was as before—the os was closed, the cervix hardened, and the relation of the parts had become as before the orgasm." According to Flint, Jr., Sitzmann of Germany published similar observations in 1846.

In 1874 one of the most important contributions to the pathology and treatment of diseases of the neck of the uterus was published by Dr. T. Addis Emmet. It had long been known that childbirth caused lacerations of the muscular portion of the neck of the uterus, but previous to his description no one had seemed to recognize how uniformly such lacerations had been confounded with so-called ulceration of the neck of the uterus, or how commonly the ectropion at the neck of the lip resulting from such tears had been mistaken for hypertrophy of the tissues. Emmet, recognizing these conditions, began to devise some method for their cure, and he advocated for this condition the paring of the edges of the ulcerated part and the bringing of them together by means of sutures.

The mode of operating, as first laid down by Emmet, is to place the patient on the left side in the Sims position, and by means of a Sims speculum bring the parts into view. The first step is to bring the flaps together in apposition, and while they are lifted up by means of a double tenaculum in the hands of an assistant a uterine tourniquet is slipped over the cervix below the point of vaginal junction, and tightened, the object of this being to control hemorrhage during the operation. The surfaces of the laceration are then freshened either with scissors or scalpel, after which they are brought together by means of silver sutures. One of the essentials to the success of the operation consists in the complete removal of cicatricial or other adventitious tissue during the freshening of the parts.

Since the introduction of Emmet's operation and the publication by its author of the *technique* of the operation, other gynecologists have adopted different means to accomplish the same results. The uterine tourniquet is not deemed requisite to control hemorrhage, nor is it the universal custom to place the patient in either the left or right semi-prone position. It is no longer deemed a prerequisite to success that silver wire must be invariably used, or that no other speculum than Sims's will suffice. Hot water will control hemorrhage. The dorsal—or, more commonly, the exaggerated lithotomy position, or the position of Simon—is chosen by many. Silk, or catgut properly prepared, is more easily introduced than silver, and is less liable to cut tissues. The silkworm-gut suture is preferred by some. Some of those who have used Simon's speculum a number of times prefer it to Sims's. This procedure is now generally known as "Emmet's operation." It is the belief of most American gynecologists—in which the writer fully concurs—that this operation marks one of the greatest advances in modern gynecology. At the same time, it is an operation which is liable to many and great abuses. Owing to the fact that so many neurasthenic women, as well as those suffering from neuralgias from the imprisonment of nervules in the cicatricial tissue of the torn uterine neck, have been relieved by this operation, many superficial observers have resorted to it with such frequency as to often bring it into disrepute. Many of our foreign brethren have also attempted to ridicule the operation, but, in spite of all, the fact still remains that no one operation or procedure of equal importance for the relief of suffering women has been devised in the last quarter of a century.

In March of this same year (1874) Emmet, during an operation for a submucous fibroid tumor of the uterus, discovered the value of traction during enucleation in producing a denuded pedicle. His mode of operating was with scissors around the base of the tumor, and to his surprise the raw surface thus left seemed much smaller than the original base of the tumor. The value of traction was several years before

insisted upon by him, but not until March, 1874, was he able to demonstrate clearly that the attenuated pedicle was the effect of the traction, and not an accident. In a case operated upon at that time he was able to encircle the broad basis of the tumor with his fingers and feel the process of pedunculation going on, as strong contraction was produced by traction, the contraction beginning at the fundus and running down in an oblique direction. On this account the traction should be made as near the fundus as possible. In this case a base of three inches in diameter became a pedicle of the size of a common lead-pencil, and the point of attachment after removal was reduced to a small pit, thus leaving an almost infinitesimal surface, comparatively speaking, for the possible absorption of septic matter.

In the year 1874 there were two papers in the *Boston Medical Journal* upon pelvic drainage after ovariectomy, by Dr. Gilman Kimball of Lowell, Mass., a distinguished pioneer in ovariectomy. Dr. Montrose A. Pallen of New York published a description of the operation as a substitute for amputation of the neck of the uterus in certain forms of intravaginal elongation, which he termed vaginal cervi plasti.

In the same year Dr. Marion Sims contributed a valuable paper to the *New York Medical Journal* upon the enucleation of intra-uterine fibroids.

In this year also appeared a small work, written in a powerful style by Dr. Edward H. Clark of Boston, entitled *Sex in Education*. No work upon medical topics or any kindred subject in modern times succeeded better in attracting the attention of the people for whose benefit it was written to the influence of the habits of modern life on the sexual organs.

In 1875 a valuable and interesting paper appeared by Dr. J. R. Chadwick of Boston in the *American Journal of Obstetrics* upon injection of nutritious or cathartic fluid into the intestines through the abdominal walls by means of an aspirator needle when the stomach proves entirely intolerant.

In this year Dr. Noeggerath of New York published in the *American Journal of Obstetrics* an interesting paper upon "Vesico-vaginal and Vesico-rectal Touch—a New Method of Examining the Uterus and Appendages."

In the *Transactions* for 1875 of the American Medical Association is a paper by Dr. Byford of Chicago upon "The Treatment of Uterine Fibroids by Ergot." This method, for the purpose of causing atrophy of uterine fibroids, was first suggested by Hildebrandt, but Byford seems to have been the first to advocate the use of this remedy in sufficiently large doses to cause expulsion in addition to the atrophy.

In this same year was published a valuable and very interesting paper by Dr. H. F. Campbell of Georgia upon "Position, Pneumatic

Pressure, and Mechanical Appliance in Uterine Displacements." This gentleman has from time to time written several papers bearing upon the same subject. He advocated replacement of uteri, if posteriorly displaced, by the patient assuming the knee-chest position, and the introduction of a glass tube into the vagina while this position is maintained. This position, by favoring the gravitation of the viscera forward, together with the introduction of air into the vagina through the glass tube, will often effect reposition of the displaced organ.

In this same year an interesting paper was contributed to the *Richmond and Louisville Medical Journal* by Dr. Goodman of Louisville upon "Menstruation and the Law of Monthly Periodicity." Dr. Brickell of New Orleans contributed also an article upon "Rupture of the Perineum, with a Description of a New Operation."

In 1875, Alexander Skene of Brooklyn performed the operation of laparo-clytrotomy, with a result never before attained. The patient was a dwarf with a rachitic pelvis, who had been three times delivered—twice by premature delivery and once by craniotomy. In her fourth pregnancy Dr. Skene allowed it to advance to the full term, and then, after labor had begun, he performed the operation, saving the mother and a healthy child of ten pounds' weight. This operation might more properly be designated as one pertaining to obstetrics, and yet we cannot forbear alluding to it here. It is one that had attracted the attention of obstetricians in our own country and in Europe at different times, and had been essayed by Skene in 1874, but first by T. Gaillard Thomas in 1870, who states that he did it without a knowledge of the fact that he been anticipated in the procedure by Baudeloque. In Dr. Thomas's case the patient died in one hour, and the child, premature and imperfectly developed, also almost simultaneously.

The year 1876, being termed the "Centennial year," as it was the year in which this country celebrated its hundredth anniversary as an independent nation, was rich in gynecological work. It also marks the beginning of a very important epoch in American gynecology—namely, the formation of the American Gynecological Society. In response to a summons issued May 24th a number of gynecologists from various parts of the United States came together at the hall of the Academy of Medicine in the city of New York for the purpose of forming a society for the advancement of the special department of medicine in which they were chiefly interested. The meeting was called to order by Dr. Chadwick of Boston, who had taken the most active part in the formation of the society, and was organized by the election of Dr. E. R. Peaslee of New York as chairman and Dr. Chadwick as clerk. Remarks were made by Dr. Peaslee upon the importance of such a society, and by Dr. Chadwick, who said that "the call to which you have responded by your presence here to-day

was addressed to a limited number of recognized gynecologists after consultation with several of the prominent men of Boston, New York, Philadelphia, and the West. It was not intended to include all those whose labors in this field of medicine would fully entitle them to an honored place in our ranks, but simply to form a nucleus around which gynecologists of the country should cluster. It seems a most fitting tribute to our national greatness that those who have striven to advance the noble cause of humanity, of science, of art in any of their departments should take steps in this Centennial year to prosecute their labors in the coming century with renewed vigor and under more favorable circumstances." These remarks apply with more than common force to the branch of medicine in which America can justly claim to stand pre-eminent. There were at this inaugural meeting the following gentlemen: Drs. Fordyce Barker, E. R. Peaslee, T. A. Emmet, T. G. Thomas, J. M. Sims, I. E. Taylor, E. Noeggerath, W. T. Lusk, P. F. Mundé, of New York; John Byrne, A. J. C. Skene, of Brooklyn; A. D. Sinelair, G. H. Bixby, J. R. Chadwick, of Boston; W. Goodell of Philadelphia; J. D. Trask of Astoria, N. Y.; T. Parvin of Indianapolis; W. H. Byford of Chicago; and Ed. W. Jenks of Detroit, Mich.

Letters were read from Drs. D. H. Storer, C. E. Buckingham, G. H. Lyman, W. L. Richardson, of Boston; W. L. Atlee, R. A. F. Penrose, E. Wallae, A. H. Smith, T. M. Drysdale, J. V. Ingham, of Philadelphia; S. C. Busey of Washington; E. Van de Warker of Syracuse; J. P. White, of Buffalo; R. Battey, of Rome, Ga.; J. C. Reeve, of Dayton, O.; and G. J. Engelmann, of St. Louis. On motion these gentlemen were added to the list of Fellows, and were considered as founders of the society.

A committee consisting of Drs. Trask, Sinelair, Jenks, Noeggerath, and Lusk was appointed by the chair to nominate a list of officers for the first annual meeting. The following list of officers was reported, and the gentlemen unanimously elected: President, Fordyce Barker; Vice-Presidents, W. L. Atlee, W. H. Byford; Council, J. M. Sims, W. Goodell, T. Parvin, G. H. Lyman; Secretary, J. R. Chadwick; Treasurer, P. F. Mundé.

The first annual meeting of the society was held in the same place Sept. 13, 14, and 15, 1876, at which twenty-eight Fellows were present. This society has since its organization, although not numbering among its Fellows all of the able gynecologists of our country, really represented the progress of American gynecology. Its annual volumes of *Transactions* have shown the rapid progress made in this specialty, and have given evidence of much original work, and each year its list of Fellows has been augmented by the election of new members, and, although many of its founders have passed away, the character of the society's work has continued to be of the highest.

Dr. Lyman of Boston published a paper on the theory entitled "A Theory of the Cause of Menorrhagia," with a list of cases treated with success by dilatation, which reads substantially as follows: "Dilatation of the cervix for surgical and diagnostic purposes is an old procedure, but that it should be followed by arrest of hemorrhage, although observed by some, was not publicly noticed until 1869 by Dr. Sims." In 1876, Dr. Lyman of Boston reported a short list of cases in which he had used dilatation with success in menorrhagia, and advanced the following theory: "In menorrhagia there is constriction of the vessels at the internal os, giving rise to congestion of the tissues above: such constriction doubtless is due to some morbid condition beneath the mucous membrane. Hence this operation is beneficial, although the opening through the canal be apparently sufficiently large. Precaution is to be taken that the hemorrhage is not due to malignant disease, and that there is no cellulitis nor peritonitis."

In this same year a valuable paper was published by Dr. Skene on the principles of gynecology as applied to obstetrical operations. Although not wholly original or the first time that many of his theories were enunciated, it is well worthy of mention in a history of American gynecology. Dr. Skene advocated the use of Sims's speculum in performing craniotomy and in using the cephalotribe, perforation being recommended to precede the use of that instrument. The use of Sims's speculum also facilitates the carrying out of Thomas's method of replacing a prolapsed cord; also the introduction of Barnes's dilators. He also recommended the use of the speculum in applying the tampon for arrest of hemorrhage and in the use of the curette or the scoop in removing the ovum.

In 1876, also, Dr. Noeggerath of New York read a paper at the American Gynecological Society upon latent gonorrhœa, especially with regard to its influence on fertility in woman. This was his first paper in the English language upon the subject, as the one in 1872 was published in the German language in Bonn. This paper has given rise to much discussion, favorable and unfavorable, and frequent allusion to it has been made in home and foreign journals. The paper and the author's conclusions are certainly unique, and we cannot forbear to allude to the latter, which he summarizes as follows:

"1st. Gonorrhœa in the male, as well as in the female, persists for life in certain sections of the organs of generation, notwithstanding its apparent cure in many instances.

"2d. There is a form of gonorrhœa which may be called latent gonorrhœa, in the male as well as the female.

"3d. Latent gonorrhœa in the male, as well as in the female, may infect a healthy person either with acute gonorrhœa or gleet.

"4th. Latent gonorrhœa in the female, either the consequence of an

acute gonorrhœal invasion or not, if it passes from the latent into the apparent condition manifests itself as acute, chronic, recurrent perimetritis or ovaritis, or catarrh of certain sections of the genital organs.

"5th. Latent gonorrhœa in becoming apparent in the male does so by attacks of gleet or epididymitis.

"6th. About 90 percent. of sterile women are married to husbands who have suffered from gonorrhœa, previously to or during married life."

In 1876, Dr. Jenks of Detroit published the result of his observations on the use of *Viburnum prunifolium* in the treatment of diseases of women. This remedy had a limited use for some years as a preventive of abortion, it having been first introduced by Dr. Phares of Mississippi. The writer advocated the use of this remedy in all forms of dysmenorrhœa attended with profuse menstruation. It is not sufficiently sedative, if given alone, to fully relieve the sufferings of spasmodic dysmenorrhœa. It is, however, a valuable adjuvant to sedative and antispasmodic remedies. In dysmenorrhœa with menorrhagia caused by fibroid growths viburnum, in combination with ergot, has proved much more valuable than either remedy given without the other. The writer gave, as a general statement concerning the uses of viburnum, "that it is serviceable in all uterine disorders characterized by loss of blood." Since Dr. Jenks's paper was published the remedy has come into more general use, and the results have shown that too much was not said in its praise.

In this year also the first ten cases of Battey's operation by Dr. Battey were published, the following results being claimed for the operation in the cases reported: Complete relief, 3; temporary relief, 2; life prolonged, 1; no benefit, 2; death, 2.

In the same year there was published by Henry C. Lea of Philadelphia a small volume entitled *A Century of American Medicine*, Dr. T. G. Thomas contributing the chapter on obstetrics and gynecology. No one except those who have had occasion to search through the volumes and periodicals for historical matter can fully appreciate the labor which such an able paper must have cost its author. It contains a summary of everything of importance that had been previously done in these departments by the profession of this country.

In 1877 a paper was published by Dr. Brickell of New Orleans on the diagnosis and treatment of pelvic effusions. Three cases are reported by Dr. George H. Bixby, one by Dr. Byford, treated by aspiration either through the abdominal walls or *per vaginam*, the latter site being preferred. The history of these cases is valuable as showing the progress in the diagnosis of pelvic effusions and the relief afforded by this mode of treatment. Dr. Brickell considers the removal of a collection of serum in the cellular tissue as necessary as the removal of a collection of pus.

A paper was read before the American Gynecological Society by Dr. Goodell on the subject of vaginal ovariectomy. This operation was first performed by Washington L. Atlee, but the first premeditated vaginal ovariectomy was, as previously stated, performed by Dr. T. G. Thomas in 1870. Dr. Goodell, in discussing the subject, concludes that while this operation can never rival the ordinary operation, it is preferable in rare cases—namely, where a small polycyst lodges in Douglas's pouch or an unadherent monocyst protrudes into the pelvic cavity. The difficulties met with in this operation are from prolapsus of the intestines and unforeseen adhesions. In this same year Dr. Paul F. Mundé made a valuable report on the treatment of ovarian tumors by electrolysis. Dr. Von Ehrenstein claims to be the originator of this method, and, although this claim is disputed, he has at least had a larger experience than any other in its use. It was brought more prominently into notice by an announcement in 1875 of Dr. Semmeller of Mexico. Dr. Mundé, from his own experience and that of others, draws the following conclusions regarding the operation: That this method is most apt to be beneficial in cases where the tumor is monocystic, and yet so small as not to demand the radical operation; or a polycyst with thin walls and fluid contents, and absence of large and solid masses; or a large unilocular or multilocular tumor, in which adhesions are so extensive as to render ovariectomy dangerous.

Although it has long been known that mental aberrations may be caused by the sexual disturbance occurring at the time of puberty, menopause, during pregnancy, the puerperal state, and lactation, the idea of connecting this abnormal mental state with disease of a non-gravid uterus is modern. The first in this country to call attention to the causative relations of uterine and ovarian disease to mental disturbances in women were Dr. Fordyce Barker of New York and Dr. H. R. Storer of Boston. The former published an article upon this subject in 1872, and the latter a monograph upon the same subject in 1871, while both had promulgated their ideas by lectures some years previously.

In 1877, Dr. George J. Engelmann made a valuable collection of facts concerning hystero-neurosis. These show that neuroses of the brain, pharynx, larynx, eye, stomach, intestines, bronchii, and joints of severe and misleading character are frequently produced by non-development or disease of the uterus or ovaries, or both, or by peri-uterine disease. That the apparent disease of the organs named was a neurosis was proved by its disappearance upon removal of the abnormal condition of the uterus.

In 1878 there appeared a paper on the causes of vesico-vaginal fistula by Dr. T. A. Emmet, in which he exonerated the forceps from the charge that has been laid to them of frequently causing such lesions,

and attributed the frequency of fistula rather to delay in delivery and the neglect to use the catheter before instrumental delivery.

In this same year appeared in the *New York Medical Journal* a very valuable contribution from the facile pen of Dr. T. G. Thomas on the most effectual method for controlling the high temperature occurring during ovariectomy. Dr. Thomas's method is as follows: Upon a Kibbee fever-cot a folded blanket is laid, so as to protect the patient's body from cutting by the cords of the netting. At one end is placed a pillow covered with india-rubber cloth, and a folded sheet is laid across the middle of the cot to about two-thirds of its extent. Upon this the patient is now laid: her clothing is lifted up to the armpits and the body enveloped by the folded sheet, which extends from the axillæ to a little below the trochanters. The legs are covered by flannel drawers and the feet by warm woollen stockings, and against the soles of the latter bottles of warm water are applied. Two blankets are then placed over the patient and the application of water is made. Turning the blankets down below the pelvis, the physician now takes a large picher of water at from 70° to 80° F., and pours it gently over the sheet. This it saturates, and, percolating the network of the cot, it is caught by the india-rubber cloth beneath, and, running down the gutter formed by this, is received in a tub placed at its extremity for that purpose. Water at a higher or lower temperature than this may be used. As a rule, it is better to begin with a high temperature, 85° to 90°, and gradually diminish it. The patient now lies in a thoroughly soaked sheet with warm bottles to her feet, and is covered up carefully with dry blankets. Neither the portion of the thorax above the shoulders nor the inferior extremities are wet at all. The water is applied only to the trunk. The first effect of the affusion is to elevate the temperature, but the next, when the application is practised for an hour, usually brings it down. The water collected in the tub at the foot of the bed, having passed over the body, is usually eight or ten degrees warmer than when poured from the picher. This mode of procedure has been modified by others, but still it is to Dr. Thomas that we are indebted for this effective means of reducing the temperature.

In this same year Dr. E. Van de Warker of Syracuse, N. Y., contributed a valuable paper containing some original opinions upon the treatment of adhesions and indurations. The objects of treatment in this case are—1st, to allay pain; 2d, to produce absorption. For the first object anodynes—namely, opium or opium combined with *Viburnum prunifolium*—are valuable. More important, however, though acting less quickly, are rest, postural treatment, hot fomentations, and an occasional blister. Swinging in a hammock admirably combines a soothing feeling, from the gentle motion, with relaxation of the abdominal muscles and elevation of the hips. The continuous current, ten

to sixteen cells, indirectly through the system and through the induration, is also important. The agents for producing absorption are less direct, but still more valuable—viz. the galvanic current directly through the mass, one electrode being placed in the vagina and one on the abdomen. The internal use of ammonium ehloride markedly lessens the size of the mass, producing absorption, probably by its effect upon the portal circulation. Careful handling at a later stage not only hastens absorption, but also tends to reduce the tenderness. The best method is by bimanual manipulation, a gentle to-and-fro motion given the mass by rolling it between the hands, one of which is placed against the vaginal and the other against the abdominal side. If the mass is situated in the iliac fossa, then the bone affords sufficient internal support, and but one hand is used.

In 1878, Dr. Henry J. Bigelow of Boston reported a number of cases operated upon by a method which he had devised for crushing and removing the fragments of stone in the male bladder. He demonstrated that tolerance by the bladder of protracted manipulation is greater than heretofore recognized, and that the operation of lithotrixy can be done at one sitting. The article of Dr. Bigelow is of great importance, and even more applicable to the female bladder when no cystitis or thickening exists.

In 1879, Dr. Edward W. Jenks of Detroit published, in the *American Journal of Obstetrics*, a paper upon perineorrhaphy, in which he described a method devised by himself for denuding the mucous surfaces with but little loss of blood. His method, given in his own words, is as follows:

“The patient being etherized, I begin by cutting with a scissors the anterior margin of surface to be denuded at the juncture of integument and mucous membrane. Next I introduce two fingers of the left hand into the rectum, while assistants hold the labia apart, it being important that they are held uniformly tense. I use scissors slightly curved and sharp-pointed to denude the mucous membrane. I use neither tenaculum nor tissue-forceps, but with the parts tense snip a hole in the mucous membrane in the median line close to the integument, and then, inserting the scissors with a cutting motion into the small hole made, I continue to dissect the mucous membrane away from adjacent tissues without removing the scissors, first going up the septum as far as desired, and then laterally, first on one side and then on the other, without removing the scissors or once bringing their points out from beneath the mucous membrane. Then with blunt-pointed scissors I cut away the dissected flaps. The advantages of this method are—*a*, the rapidity with which it can be done; *b*, the absence of hemorrhage in the vagina, as no blood escapes at the locality where the scissors enter beneath the mucous membrane; *c*, the ability with which the operator

can make complete denudation, as the discoloration beneath the mucous membrane marks the route the scissors have taken. This mode of operating is only applicable where there is redundancy of the tissues, and not where there has been great loss of substance, as in cases where the septum has been torn to any great extent."

The same author describes also in the same paper a new method of securing the sutures in the operation of kolpo-perineorrhaphy.

In this same year there was a valuable contribution on the subject of ovarian diseases made by Dr. Mundé, entitled "Prolapsus of the Ovaries." In this paper he gave points in diagnosis and modes of treatment. Mention, however, had been made of this subject in the *Journal of the Gynecological Society* of Boston in 1872 by Storer, Warner, and Blake. In this publication, covering the results of his observations, Mundé calls attention to the fact that uncongested ovaries may become prolapsed, and in turn prolapsus leads to congestion. He calls attention to points now well known, that many of these cases were undetected, and directs attention to the physical and mental derangements to which they lead. He also directs attention to the value of the genu-pectoral position and Sims's speculum as aids in their replacement. In the discussion which followed this paper, which was read before the American Gynecological Society, Dr. Barker recommended suppositories of iodide of lead if painting the vaginal roof with iodine produced too much irritation. Drs. Bozeman and Mundé had found iodoform useful in these cases for the relief of the hyperæsthesia. Dr. Albert H. Smith advised examination by rectum for diagnostic purposes, and Dr. Skene alluded to the pain during and after defecation as a diagnostic symptom. Dr. Taliaferro of Atlanta, Ga., was the first to suggest packing the vagina with cotton tampons to support prolapsed ovaries. In April, 1878, Dr. Taliaferro, in a paper read before the Medical Association of Georgia, advocated pressure by the tampon as a therapeutic in the treatment of uterine and periuterine diseases.

In 1880 a paper was written by Dr. Chadwick advocating the use of hot rectal douches in the treatment of pelvic inflammations.

At the meeting of the American Gynecological Society in 1880, C. D. Palmer of Cincinnati read a full and instructive paper entitled "Laparotomy and Laparo-hysterotomy, their Indication and Statistics for Fibroid Tumors of the Uterus."

In this year also a paper was read by Dr. A. Reeves Jackson of Chicago, at a meeting of the American Gynecological Society, on "Uterine Massage" as a means of treating certain forms of enlargement of the womb, which, although not wholly original with the writer, gave rise to some considerable discussion in home and foreign medical journals.

In 1881 an interesting paper was published by Dr. Van de Warker

in which he recommends forcible elongation of pelvic adhesions in cases where they cause pain during defecation or other straining efforts.

In this year Dr. Thomas published a paper upon "Laparotomy complicated by Expansion of the Bladder over the Surface of Abdominal Tumors, and its Attachment to them or to the Abdominal Walls." He made a collection of reports and cases, and offered the following mode of procedure: "As diagnosis even by the sound is difficult, if it is not impossible, this complication is not perceived until the abdominal incision is made or the bladder laid open. If it happens to be attached to the abdominal parietes, the bladder should be separated by digital detachment. If adhesion is too close, then incise the anterior wall of the bladder; if incision has not already been made, with two fingers in the bladder as a guide the adhesions can be cut. Then clamp the edges of incision between the lips of the abdominal wound, and close by silver sutures."

An interesting paper by Dr. William Goodell of Philadelphia was published on "Bursting Cysts of the Abdomen," in which the author alludes to the great difference, as far as danger is concerned, between parovarian and ovarian cysts, the contents of the former usually being limpid and innocuous, and the fluid eliminated frequently by the kidneys, intestines, or skin, and is usually rapidly taken out. In case of the bursting of ovarian cysts the danger is much greater. He alludes to a case seen by Dr. Sims in 1856 which burst three times, the fluid being eliminated by each of the three channels mentioned—one entirely by the kidneys, another entirely by the intestines, and the remaining one wholly by the skin.

In 1882, Dr. Emmet brought to the notice of the profession his new method of exploration and treatment of the urethra by the "button-hole incision," as he designates it. He first essayed this method in 1879. It consists of a buttonhole incision in the urethra extending from near the meatus to a short distance from the neck of the bladder, the greatest length being on the vaginal mucous membrane. Retention is not impaired, and diagnosis and treatment are greatly facilitated. The special advantage of this method is the facility which it offers to the diagnosis and treatment of polypi or other growths about the neck of the bladder. After the cure is effected the opening is easily closed.

In this year Dr. J. C. Warren of Boston offered a new method of operation for laceration of the perineum involving the sphincter and rectal wall. The operation consists in dissecting a butterfly flap from the posterior vaginal wall above the rent, and a similar flap from above downward, leaving plenty of attachment around the entire edge of the ruptured rectal wall and sphincter. The flap is turned downward, covering the rectal rent. The freshened edges of the sphincter are brought together over the flap, which hangs out of the anus like a small hemor-

rhoid. All freshened surfaces are then brought in coaptation, the flap being laid in folds. The part hanging from the anus if not too long will draw up as cicatrization takes place.

In January of this year Dr. Christian Fenger of Chicago recorded the first successful operation of kolpo-hysterectomy for uterine cancer, at which time he also advocated the operation as a justifiable one. Dr. O. Stroinsky of Chicago in this year reported a novel operation for traumatic rupture of the bladder: while removing a fibroid polypus from the bladder by twisting he made a rent into the anterior wall, inverted the whole bladder through the dilated urethra, repaired the rent by three sutures, and replaced the bladder. The result was recovery.

In 1883, Dr. C. C. Lee read before the American Gynecological Society a paper on the injuries of the gravid uterus as a complication of laparotomy. From a study of a necessarily small collection of cases both at home and abroad, the first occurring in 1856, Dr. Lee concludes that—1st, the gravid uterus may be wounded without necessarily producing abortion; 2d, abortion seems to depend upon opening the ovisac; 3d, if the uterine contents are injured Cæsarean section is indicated, after which drainage may be maintained through the dilated cervix; 4th, if the uterine contents are uninjured, the wound is to be treated on general principles—namely, exact coaptation by carbolized sutures.

In this year, too, Emmet describes a new operation for so-called laceration of the perineum. It is considered particularly useful where there are large rectocæles. In this paper he holds that the loss of support following the laceration produced by childbirth is not due to the injury of the perineal body. In fact, he denies the existence of any such body, and claims that the injury is due rather to the detachment of perineal muscles and the perineal fascia. The description of this operation by the author is by no means lucid, but it substantially consists in a semilunar form of denudation, wholly within the vagina, of such extent that when the edges are brought together by means of sutures the "slack" in the posterior wall is entirely taken up or made to disappear, and yet the ostium vaginae is in no way denuded or directly interfered with. The advantages claimed are—great diminution in the discomfort following immediately after the operation, and the perfect juxtaposition of the anterior and posterior vaginal walls, as in the non-parous woman.

In the *Transactions* of the American Gynecological Society for 1883 appears a paper by Dr. E. W. Jenks describing a new mode for operating for fistula in ano. In the same volume is a paper of Dr. Emmet's, in which he alludes to having performed the operation in the same manner, neither gentleman having been aware of the fact that the other

had performed the operation. Dr. Jenks's first operation was on March 31, 1881. The operation consists in incising the fistulous tracts after the usual method, dissecting out the so-called pyogenic membrane and all lardaceous and cartilaginous substances along the route of the fistula, and also cutting away all portions of thin livid skin of low vitality. The incised parts are maintained in perfect apposition by means of deep and superficial sutures until adhesion is effected.

In this year Dr. W. H. Byford published an interesting paper upon chronic abscesses of the pelvis, and the following points are made prominent: When the surface of a pelvic abscess is identical with that of an external ulcer, granulations may be exuberant or freely movable and flabby or firm and vigorous. When the granulations are exuberant, forming large projections into the abscess-cavity, its surfaces should be everted. The same operation is also indicated when early suppuration takes place in pelvic hæmatocoeles, in order to remove the clots which suppuration cannot dispose of. As granulations disappear and cicatrization takes place the contents of the abscess undergo changes. Serum exudes, macerating and finally disintegrating the pus-corpuscles and causing them to disappear. Osmosis going on through the cicatricial membrane converts the contents into simple serum. There then results an encysted tumor containing serum-like fluid.

It is believed that Dr. Charles K. Briddon was the first in the United States to perform laparotomy after rupture of the foetal sac in tubal pregnancy. This he did in October, 1883.

Dr. Matthew D. Mann was the first to publish a successful operation, performed in February, 1883, in which he removed a small subperitoneal fibroid tumor of the uterus through the anterior wall of the vagina.

In this year an operation for the cure of retroversion of the uterus was described by J. B. Hunter of New York. Dr. O. E. Herriek of Michigan had also performed and reported the same operation, each gentleman working independently. The latter, however, it is believed, is entitled to the credit of being the first to perform the operation. The operation consists of a denuded surface upon the posterior lap of the uterus which is united by sutures to a similarly denuded surface upon the posterior vaginal wall.

In the January number of the *American Journal of Obstetrics* of this year Dr. Garrigues of New York published a paper upon laparo-clytrotomy. In this paper he alluded to the place of incision and the position of the ureters, and pointed out how they might be avoided during operations. Dr. Polk of New York had written upon the subject the previous year, and Dr. Garrigues had himself investigated it in 1878. Drs. Polk and Garrigues agree, from experiments made upon the cadaver, that in the operation of laparo-clytrotomy the ureter is safer from injury if it remains below rather than above the incision.

In November of this year Dr. B. Bernard Brown of Baltimore performed a new operation for the reduction of an inverted uterus. An incision was made in the fundus of the uterus, through which he passed one of Sims's large dilators up through the cervix, expanding the latter to the fullest extent. He then passed through hard-rubber dilators, and having assured himself, by means of the finger, that no adhesions existed, the incision of the fundus was sutured, and with some manipulation the fundus was easily pushed up through the now dilated cervix, and the operation was complete.

In 1884 a valuable paper was published by Dr. Palmer of Cincinnati, entitled "Abdominal Section, its Value and Range of Application as a Means of Exploration and Treatment." This paper was read before the American Gynecological Society, and gave rise to much valuable discussion. In this year an instructive paper by Dr. Thomas appeared, entitled "Management of the Placenta after Laparotomy in Abdominal Pregnancy at Full Term or Beyond."

An unique and interesting article from Dr. Isaac E. Taylor of New York was published upon physiognomy of the vulva following anal diseases. Dr. Taylor had made observations in this connection which may be considered as very useful in diagnosis. He directs attention to anal diseases causing changes in the appearance of the vulva as painful affections, coming under the head of—1st, spasmodic contractions of the anus; 2d, neuralgia or hysterical hyperæsthesia; 3d, irritability or indolent fissure in that locality.

An interesting article was published in the *American Journal of Obstetrics* of November, 1883, to March, 1884, by Dr. H. R. Bigelow, entitled "Gastrotomy for Myo-fibromata of the Uterus." It is one of the most valuable contributions to our knowledge of the subject up to that time. He alludes to the publication in 1853, by W. L. Atlee, of a paper entitled "Surgical Treatment of Certain Fibrous Tumors of the Uterus" as the beginning of a movement in the treatment of uterine fibroids. Until 1863 a few surgeons at home and abroad, like Atlee, Burnham, and Kimball, on opening the abdomen for ovarian tumors, having found a uterine tumor, ventured to remove it. Burnham made a supravaginal hysterectomy June 26, 1853, and the patient recovered. This was the first successful case in America. Afterward Koeberle of Strasburg was the first to deliberately open the abdomen for the purpose of removing uterine fibroids and fibrous cysts, which he did by ligature if pedunculated, or by the performance of hysterectomy if they were intramural or sessile. Dr. Storer was among the first in America to deliberately follow in his footsteps. Dr. Kimball of Lowell with equal boldness operated about the same time as Koeberle.

In writing of early operators Bigelow states that "Kimball and Koeberle seem to be the only ones whose operations were based upon a

correct diagnosis." The present status of such a treatment of myofibromata of the uterus was concisely set forth in this year by Dr. R. S. Sutton of Pittsburg in an article on "Non-malignant Tumors of the Uterus;" and several American writers on uterine fibroids give Dr. Goodell the credit of being the first in the United States to remove ovaries to prevent further growth in uterine fibroids, but the date of his operation we are unable to state.

Dr. H. A. Kelly of Philadelphia reports a successful operation for sessile cervical fibroids above the vaginal roof by abdominal incision. Free hemorrhage was checked by the use of Paquelin's cautery applied deep in the peritoneal cavity. The first successful case of laparotomy for pelvic abscess in this country was made by Dr. R. S. Sutton in June, 1884.

A very interesting address was made at the meeting of the American Gynecological Society in 1885 by Dr. Wm. T. Howard upon encysted tubercular peritonitis. He had collected from various sources six cases in which there was interference: one of these was aspirated, three tapped, two operated upon as in ovariectomy, and all died. One case was simply treated by hygienic and therapeutic measures, and recovered. Some of his clinical conclusions are that tubercular peritonitis appears in early life. Its development is rapid, varying from six weeks to eight months. Being rarely a local affection, we should search for indications of the disease in other parts of the body. A number have observed that a red blush of the central anterior part of the abdominal wall is characteristic of tubercular peritonitis.

At the meeting of the Gynecological Society of this year (1885) quite a lengthy discussion was held upon modifications of Emmet's operation upon the cervix uteri, called forth by a paper of Dr. Sutton's. The majority of the members participated in this discussion, and the fact was clearly demonstrated that the mechanical ingenuity of the different gynecologists is of the highest order.

Dr. Goodell reported this year having observed a form of parotitis following operations upon the female genital organs which was not of septic origin. That such diseases might occur is owing to the relationship which is known to exist between the sexual organs of the adult and the cervical and salivary glands. The inflammation observed by Goodell closely resembles mumps, and usually ends in resolution unattended with any of the signs of septicæmia, such as frequency of the pulse or glassy appearance of the eye. This variety of parotitis lasts longer than mumps. Instead of the patient failing as in septic inflammation, she gains *pari passu* with the continued enlargement of the glands. His first case was reported to the Obstetrical Society of Philadelphia in October, 1884.

In this same year Dr. Alfred C. Post of New York reported a new

form of operation for lacerated perineum, which may be briefly described as follows: An incision of half an inch in depth is made upon each side of the vagina in such a manner as to make upper and lower segments. The upper segments are turned up to form the floor of the vagina and secured by a row of catgut sutures passed through the subcutaneous tissues. A row of silver sutures is passed beneath the bottom of the incision. The lower edges are also united by fine sutures.

In the *New York Medical Journal* of this year Dr. John Scott of San Francisco reports a case of chronic pelvic abscess treated by abdominal incision. After the abscess-cavity was washed out a drainage-tube was passed through the incision into Douglas's cul-de-sac and through into the vagina. The abdominal incision was then closed; recovery.

In June of this year Dr. B. E. Hadra of San Antonio, Texas, read a paper before the section of Diseases of Women at the American Medical Association, entitled "Intraperitoneal Adhesions in Relation to Tait's Operation." He calls attention to the marked relief in some cases after Tait's operation in which disease of the tubes and ovaries was not extensive. This fact he considers due rather to the breaking up of adhesions—namely, of the intestines to the fundus or sides of the uterus; also extra-pelvic adhesions, especially adhesions between the omentum and parietal or visceral peritoneum. He advocates laparotomy for a new purpose—namely, to free the peritoneum throughout its entire area.

In a paper on vulvar and vaginal enterocele, read before the New York Academy of Medicine in 1885, Dr. T. G. Thomas advocated a new method of treatment for vaginal enterocele in cases not amenable to the ordinary measures—namely, laparotomy and dragging up the hernial sac and fastening it to the abdominal wound. He reports one case in which this plan was partially pursued with successful result.

In a series of articles in the *American Journal of Obstetrics* in 1885, entitled "Studies in Endometritis," Dr. Mary Putnam-Jacobi further develops the cyclical theory of menstruation which was first enunciated in 1878 by Dr. Goodman of Louisville. The theory which she sets forth is substantially as follows: The endometrium above the os internum, the mucosa of the Fallopian tubes, and the cortex of the ovaries are designated as the "*germinative membrane*." "The epithelium and subepithelial cells of this membrane are directly derived from the germinal epithelium of the embryonic hypoblast which covers the reproductive eminences of the pleuro-peritoneal cavity." . . . "In all the elements of germinative membranes persists the embryonic property of indefinite growth." This process is changed from continuous to cyclical through the mechanical obstructions which are encountered after a certain point in growth is reached. Dr. Jacobi, like Dr. Good-

man, separates ovulation and menstruation as far as cause and effect are concerned. Ovulation and menstruation are usually synchronous. The former does not cause the latter, but both are produced by the same cause—namely, growth of embryonic tissue. / Aug - 4. 84

In 1885, Dr. Baird of Texas advocated a new method for the treatment of pelvic cellulitis for arresting exudation and pain, and applies the galvanic current. He reports a case also where pus had formed, which he evacuated by aspiration, and then injected the cavity with salt water, and applied a galvanic current to the cavity, with the result of speedy contraction of the abscess and radical cure.

In 1886, Dr. Sarah E. Post published in the *American Journal of the Medical Sciences* an exhaustive résumé upon the subject of kolpohysterectomy, which comprises a collection of all cases on record, with a short history and description of each of the various modes of operating.

Dr. H. Marion Sims of New York read this same year, before the New York Obstetrical Society, a paper on ventral hernia following ovariectomy, in which he advocates a radical operation for its cure. In a patient who suffered very much pain on account of the hernia, the hernial ring being ten inches in diameter, he excised an elliptical piece of skin, and then united the peritoneum by Lembert sutures. Then the muscles and fasciæ were united separately with catgut and silver wire. The result was a perfect recovery.

Dr. Polk of New York reported to the Obstetrical Society of New York a case of pelvic abscess which was operated upon *outside* of the peritoneum by means of an incision made as in that for ligating the iliac artery, the patient recovering.

January 20th of this year the first annual meeting of the Alumni Association of the Woman's Hospital of the State of New York, composed of former medical officers and house-surgeons, was held. A permanent organization was effected, and Dr. J. B. Hunter was chosen president. At this meeting many interesting papers were read and discussed, most of which have been published in medical journals; a history of the institution was also read, it being altogether a meeting of the alumni.

In mentioning the historical points heretofore the writer has aimed to pursue a chronological order, but there are some items relating to gynecological history which, being matters of development, can hardly be spoken of as pertaining wholly to any one year, and therefore will now be alluded to.

In this connection attention is directed to the use of electricity in the treatment of uterine fibroids. Among those who have investigated this subject and experimented and published their results may be mentioned Dr. J. N. Freeman of Brooklyn, Dr. Engelmann of St. Louis, Dr. Everett of Clyde, O., Dr. Martin of Chicago. These gentlemen

have written upon electrolysis in the treatment of subperitoneal and intramural fibroids. Drs. Thomas, Mundé, Vanderveer, and Semmleder of Mexico have experimented and written upon electrolysis in the treatment of ovarian tumors. Dr. Mundé gives a report of fifty-one cases which he has collected from various sources, of which there were nine deaths and fourteen failures, the remainder being benefited or cured.

In 1874, Dr. Gilman Kimball published in the *Boston Medical Journal* a paper entitled "Treatment of Uterine Fibroids by Electrol-ysis or Galvanism." In 1878, Ephraim Cutter reported fifty cases of uterine fibroids treated by electrolysis by Kimball and himself. These cases were treated during the period extending from 1871 to 1877, with the following results: Non-arrests, 7; death, 4; arrests, 32; relieved, 3; cured, 4. Writing of these cases nine years later (in 1887), Cutter shows that time has served to strengthen rather than weaken the position which he and Kimball took as pioneers of this method, for the present résumé of those same fifty cases now stands thus: Non-arrests, 7; fatal, 4; arrests, 25; relieved, 3; cured, 11.

Dr. Robert Newman of New York is the veteran advocate in America of the electrolytic treatment. He reported the results of some of his labors in this direction as early as 1867. Reports of successful cases of electrolysis in extra-uterine pregnancy have been made by Drs. A. D. Rockwell, T. G. Thomas, E. G. Landis, N. Bozeman, Garrigues, J. C. Reeve, William T. Lusk, and others.

Hot water, which is so generally made use of in the treatment of diseases peculiar to women, and has had such an ardent advocate in Dr. Emmet, was first brought to the attention of the profession as a hæmostatic during surgical operations by the late Dr. Pitcher of Detroit in 1859.

A valuable contribution to gynecology has been made by Dr. H. Coe, the pathologist of the Woman's Hospital of New York. His published observations of certain conditions of the ovaries have been revelations to many who believed that anything appearing like a cyst upon the ovary indicates disease demanding removal. Some of his conclusions are as follows: Laparotomists often judge of ovarian diseases by—1st, thickening of the cortex of ovaries: such thickening is perfectly normal in the senile organ or after frequent ovulation; 2d, by the appearance of a "cystic" degeneration, which is often only hydrops folliculorum, and, according to Olshausen, "the stroma of the ovary in these cases is intact and most of the vesicles are normal." This condition seldom attains any clinical importance, because the changes produce no symptoms. Dr. Coe states the case of a perfect ovum found within a Graafian vesicle as large as a marble. Of a large number of tubes removed by different operators which Coe has examined, only one-fifth had true pyosalpinx. A less number were affected with hydro-

salpinx, and only one with hæmatosalpinx. An acute catarrhal salpingitis had been found in women who had died from acute peritonitis following extension of acute purulent endometritis. Chronic catarrhal salpingitis he has not found. Thickening of the fibroid muscular tissue without evidence of inflammation is rare. This condition has been designated pachysalpingitis. Coe gives this as a rule: Unless *pus* is found there is *no pyosalpinx*.

In 1882, Dr. Baker of Boston originated the cone-shaped excision of the neck of the uterus for cancer, the apex of the cone being carried far above the os internum. Dr. Baker has also cured a case of congenital malposition of the ureter. The ureter opened into the vagina near the meatus urinarius. He dissected up a portion of the misplaced ureter, made an opening in the original bed near the neck of the bladder, and turned the stump through it and closed the vaginal wall over it. About a year after he was obliged to open the bladder and remove a stone which had probably formed as the result of leaving a raw surface in the bladder. Phosphates are often deposited upon such surfaces.

In 1886, at a meeting of the American Medical Association, Dr. A. F. Pattee reported great success for many years with potassium chloride in the treatment of anæmia, exudations from pelvic cellulitis in ovarian neuralgia, menstrual headache with wakefulness, he having found the remedy more advantageous than potassium bromide or ammonium chloride.

Dr. Byrne of Brooklyn in the October and December numbers of the *New York Medical Journal* for 1878 published a new method of reducing inversion of the uterus by means of an instrument consisting of a curved stem, to the end of which is attached a cup for receiving the inverted uterus. The stem is traversed by a rod which is affixed to a disk forming a false bottom of the cup. Counter-pressure upon the abdomen is maintained by means of an open bell-shaped cup, through the centre of which passes a screw provided at the lower end with a conical plug of hard rubber, and on the opposite or lower extremity a flat knob for a handle.

Heretofore, in speaking of the mechanical treatment of uterine displacements, credit has been given to Dr. Hodge for his ingenuity, but American ingenuity has been taxed to its utmost in the invention of pessaries, the most valuable of which are some form or modification of the one originally invented by Hodge. Among those most worthy of mention are the pessaries of Thomas, Emmet, and Albert H. Smith. Gehrung of St. Louis has devised various forms—one particularly useful in anteversion or procidentia accompanied by anteversion or cystocele—and so has Cutter. All forms of gynecological instruments have been devised, and there is scarcely an operator but has originated or modified some form of instrument, to which his name is attached.

One of the improved pessaries is the block-tin pessary devised by Sims about 1859. He recognized the necessity of having a pessary fit the canal in which it was to be placed, and devised pessaries from that material to accomplish this purpose.

Prior to Dr. Sims's book most of the works published in this country upon diseases of women were either foreign works edited by American physicians or were treatises chiefly upon diseases of the puerperal state. In 1826 was published the treatise on *Diseases of Females*, by William P. Dewees. This book reached its tenth edition. From 1852 to 1855 the clinical lectures of Dr. G. S. Bedford were published in medical journals, after which they were published in book form. The work of Dr. C. D. Meigs, published in 1850, which ran through several editions and was written in the most charming manner, was in no degree a representative of modern gynecology. In 1860 was published *Diseases Peculiar to Women, including Displacements of the Uterus*, by Hugh L. Hodge. The first edition of Byford's work upon medical and surgical treatment of women was in 1865. Dr. Marion Sims's book, entitled *Clinical Notes on Uterine Surgery*, was published in 1866. In 1868 a treatise upon vesico-vaginal and vesico-rectal fistulæ, by T. A. Emmet, was published. In 1868 was published a book by T. Gail-lard Thomas entitled *Practical Treatise upon the Diseases of Women*. This work was the fullest and most systematic treatise that had ever emanated from an American author. As early as 1880, so great had been the demand for this book, it had run through four editions, and the fifth was published, much revised and enlarged. Especially noteworthy are the chapters entitled respectively "An Historical Sketch of Gynecology" and "The Anatomy, Physiology, and Pathology of the Female Perineum." The former is a concise and most interesting article on gynecology, dating back to ancient times. The latter, an ably-written chapter, has especial reference to the functions of the perineal body and the necessity of restoring it after rupture, even though incomplete.

The first journal devoted to obstetrics and gynecology appeared in 1868, edited by Dr. B. F. Dawson, to whose energy and untiring efforts chiefly this journal owes its origin. It first appeared as a quarterly. After some years Dr. Dawson was succeeded by its present able editor, Dr. Mundé. The first journal devoted especially to gynecology was the *Journal of the Gynecological Society of Boston*, edited by Drs. H. R. Storer, G. H. Bixby, and W. Lewis. It first appeared in 1869, and exercised no inconsiderable amount of influence.

In 1872, Dr. E. N. Chapman, a former professor of obstetrics and diseases of women in the Long Island College Hospital, published his work on *Diseases and Displacements of the Uterus*, which met with rather rough usage at the hands of reviewers, although

possessing considerable merit. The book never reached its second edition.

In 1872, Dr. John Byrne's (of Brooklyn) monograph, entitled *Clinical Notes on the Electric Cautey in Uterine Surgery*, was published. Notwithstanding this gentleman's enthusiastic advocacy of the electric cautey and the good showing of his clinical reports, this mode of treatment is not at the present time held in the high esteem it once was by leading American gynecologists.

In 1872 was published by Appletons the truly classical work *On Ovarian Tumors*, by Edmund R. Peaslee, which was dedicated "To the memory of Ephraim McDowell, M. D., the father of ovariectomy, and to Thomas Spencer Wells, Esq., the greatest of ovariectomists." Of this great work his friend and biographer, Professor Fordyce Barker, writes for the third volume of the *Transactions of the American Gynecological Society*: "No work has been published in this country on any special subject of medical science of higher merit than his, as regards its plan of arrangement, its artistic excellence of execution, its literary finish, its learned, impartial, historical research, its soundness in pathology, its keen analytical teaching of diagnosis, its wise, prudent, practical, and thorough directions as regards treatment, both in the medical and surgical aspects of the subject." This work will be "an imperishable monument to his name."

Soon after Peaslee's book was published appeared another work (in 1873) on *Ovarian Tumors*, which had been announced, and the publication of which had been eagerly anticipated by all interested in the operation of ovariectomy in the United States. The work referred to was written by Washington L. Atlee, who up to this date had made more ovariectomies than any other American. This truly valuable book differs widely from Peaslee's, as it is more purely clinical and personal, showing as it does the many years of its author's labors as a pioneer ovariectomist. The twenty-fourth chapter of this volume, entitled "Dropsical Fluids of the Abdomen, their Physical Properties, Chemical Analysis, Microscopic Appearance, and Diagnostic Value, based on the Examination of Several Hundred Specimens," was contributed by Dr. Thomas M. Drysdale.

In 1876 appeared the first volume of the *Transactions of the American Gynecological Society*, which have appeared from year to year since that time. Allusion has herein before been made to the organization of this society and the influence which it has exerted on the progress of gynecology in this country. Nor has this influence been confined to the United States alone, but has been felt in foreign countries. After the appearance of the sixth volume of the *Transactions* the following introduction to a translation of one of its articles by the distinguished Prof. Kleinwächter appeared in the *Deutsches Archiv für Geschichte der*

Med. u Med. Geog., in which the translation was published. After writing at some length in a commendatory manner of the foundation of the society and its founders and *Transactions*, he says: "Up to the present time six volumes have appeared, which are an ornament to our libraries of special sciences and contain an abundance of highly interesting and valuable contributions, as would be expected, for amongst the co-workers may be enumerated such men as Washington Atlee, Fordyce Barker, William Byford, Thomas Addis Emmet, George Engelmann, William Goodell, Charles Carroll Lee, William Lusk, Paul Mundé, Emil Nœggerath, Randolph Peaslee, the universally-known and celebrated Dr. J. Marion Sims, T. Gaillard Thomas, and others whose scientific reputation is everywhere known and recognized." Aside from the scientific interest which the *Transactions* possess, Kleinwächter considers the medico-historical characteristics noteworthy: "The previous volumes contain full biographies of Simon (of Heidelberg), Charles Buckingham, Randolph Peaslee, Marmaduke B. Wright, and others. The fifth volume contains an extensive paper, illustrated with numerous cuts, upon midwifery among the various peoples of the globe, by Engelmann, and in the sixth is a noticeable contribution from the pen of Edward W. Jenks entitled 'The Practice of Gynecology in Ancient Times.'" . . . "If the English and French cultivate the history of medicine, we need be less surprised, for both of these nations possess a famous history of more than a thousand years, and such a one doubtless stimulates historical research. The Americans are without an ancient national culture, and therefore without an ancient history, and yet we see them fostering the history of medicine. With this people $\alpha\tau' \epsilon\tilde{\iota}\sigma\chi\eta\nu$ of the present, necessity has compelled it to make a path for itself, in order to learn what the ancients knew and did, in order not to be too one-sided—in other words, more fully to comprehend the spirit of medicine than it is possible by the modern methods of so-called exact investigation."

In 1878 was established the *Obstetric Gazette*, published in Cincinnati and edited by Edward B. Stevens; it has also a department devoted to diseases of women.

Dr. Skene's book, entitled *Diseases of the Bladder and Urethra of Women*, first came out in 1878. This volume is the only one of its kind which has been published in this country, and its intrinsic value has greatly served to establish and extend the justly-deserved reputation of its author as an authority on the disorders of which it treats.

In 1879, Emmet published his work entitled *Principles and Practice of Gynecology*. This work is a clinical work, and is totally unlike the systematic treatise of Thomas. Owing to the author's long connection with the Woman's Hospital of the State of New York, first as assistant to Dr. Sims, next as surgeon-in-chief for many years, and later as one

of the surgeons of the staff, his experience has given him great advantages in the way of clinical observation, of which his book bears an abundant evidence. This book has passed through several editions, the last one being practically a new book, so much has been rewritten and added since the first edition appeared.

In 1879 was published the clinical lectures of Dr. Wm. Goodell of Philadelphia, entitled *Lessons in Gynecology*.

In 1881 a new edition of Byford's work was published on the diseases of women, but so changed from the first edition as to be practically a new work, fully abreast of the times and worthy of its industrious author.

In 1880, Mundé published a work entitled *Minor Surgical Gynecology*. The second edition appeared in 1885—a work of great use to the younger members of the profession, for whom chiefly it is written.

Obstetrical societies were formed many years ago in a few of the larger cities, but the first gynecological society organized was the Gynecological Society of Boston, established in 1869. Its *Transactions*, published monthly, exerted a widespread influence on the interests of gynecology, which was due chiefly to the labors of Dr. H. R. Storer and a few of his colleagues. Although the journal has been discontinued, Dr. Storer having been compelled to withdraw from active work by reason of his illness, the society continues to hold its stated meetings.

Other obstetrical and gynecological societies have been established quite universally. Where obstetrical societies exist, gynecology shares with obstetrics in the attention which is devoted to it. Gynecological societies exist in Washington, Chicago, Detroit, Baltimore, and several other cities, while the principal part of the work of the obstetrical societies of New York, Philadelphia, and some other cities seems to be gynecological.

In 1870 the American Medical Association passed resolutions recommending that the establishment of chairs of gynecology separate from that of obstetrics be more generally adopted by medical colleges and schools throughout the country. The direct cause of these resolutions was a memorial presented to the association by the Boston Gynecological Society. The Medical College at Castleton, Vt., was the first one in which special attention was given to the diseases of women, Dr. Woodward lecturing upon gynecology as well as upon obstetrics. Probably the first college to found a full professorship of gynecology was Dartmouth, Dr. Peaslee being its incumbent. About the same time Dr. H. R. Storer gave a full course of lectures on gynecology in Berkshire Medical College, Massachusetts, of which institution he was professor of obstetrics and diseases of women.

As early as 1871 there were thirteen medical colleges in the United States in which there were full professorships of gynecology and of obstetrics. Of this number, there were seven schools with full professorships of the diseases of women, incumbents teaching nothing else—namely, the Albany Medical College, E. R. Peaslee; Long Island Hospital College, A. J. C. Skene; St. Louis College of Physicians and Surgeons, M. A. Pallen; University of Louisville, T. Parvin; the Medical College of Ohio, C. D. Palmer; University of Pennsylvania, Wm. Goodell; Detroit Medical College, Edward W. Jenks; and there were eight professorships of gynecology and the diseases of children combined—namely, University of New York, F. D. Lente; Medical College of Virginia, J. S. D. Cullen; University of Maryland, W. D. Howard; Washington University, Baltimore, M. P. Scott; Miami Medical College, B. F. Richardson; Indiana Medical College, T. B. Harvey; Medical College of Evansville, D. Morgan; Louisville Medical College, J. A. Ireland. Since then the authorities governing medical schools and colleges, realizing the importance of gynecology, have in almost every instance added a separate professorship of that specialty.

The foregoing historical sketch of the rise and progress of gynecology in America, imperfect though it necessarily be, can scarcely fail to impress the reader with a sense of the important part which this country has borne in the development of this division of medicine. The profession of America has, in what it has already accomplished, both demonstrated a peculiar aptness in this particular field and given a guarantee for the future. With the increasing facilities which increasing wealth, and its accompaniment of growing freedom from the mere money-getting obligations resting on physicians, and the enthusiasm in their work which seems to an extent to be peculiar to workers in this field, the future of gynecology in this country is big with hope and promise. It is but fitting that the land which furnished the pioneers should furnish also those who shall carry on to its fullest possible perfection the work so auspiciously begun. The mantles of McDowell and Sims and Peaslee and the Atlees have fallen on worthy shoulders, and coming generations will accord to many now living places beside the pioneers who have rested from their labors.

THE DEVELOPMENT OF THE FEMALE GENITALS.

BY HENRY J. GARRIGUES, A. M., M. D.,
NEW YORK.

As in other departments of the history of the development of the human body, so our knowledge of the earliest stages of development of the female genitals is chiefly derived from the study of the development of the corresponding parts in animals, especially the chicken and the rabbit.

THE WOLFFIAN DUCTS.¹

The first organs belonging to the genital sphere which appear in the male and female are the Wolffian ducts. In the chicken embryo they appear during the latter half of the second day. There is one on either side. It begins at the level of the fourth or fifth protovertebra, and extends rapidly backward, so that at the beginning of the third day it reaches the last protovertebra. At first it is a solid column, which later, by the formation of a cavity in its interior, is transformed to a tube. On cross-section of embryos it makes its first appearance as a small protuberance from the lateral plates where they come together with the protovertebral columns.

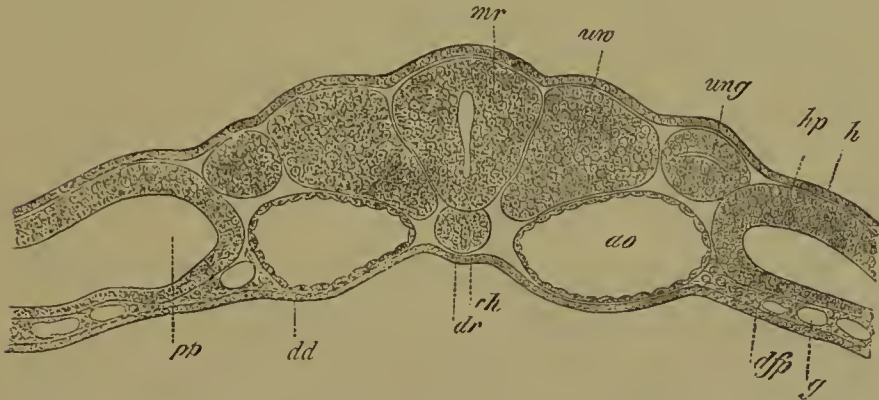
The posterior end of the Wolffian duct opens into that part of the allantois which is situated within the body of the embryo, and communicates with the cloaca, and later, after the separation between the intestinal and urogenital canal has taken place, into the urogenital sinus described below.

In the rabbit the Wolffian duct appears at the end of the eighth or the beginning of the ninth day, and is developed in the same way as in the chicken. On the eleventh day it opens into the urogenital sinus. Fig. 1 shows its situation between the protovertebral column, the lateral plate, and the descending aorta. On one side it is yet a solid string, on the other it has begun to be changed into a canal. In Fig. 2 we see it open into the urogenital sinus. Its lower end lies on either side of the body, imbedded in a ridge which Waldeyer has denominated *plica urogenitalis*. According to the same author, the Wolffian duct is

¹ Casper Friedrich Wolff, *Theoria Generationis*, Berlin, 1759; "On the Development of the Intestine," in *Nov. Comment. Acad. Petropol.*, 1768-69.

not formed by the perforation of a solid column, but by the application of the above-mentioned protuberance to the lateral plates, whereby first a channel, and then a closed tube, is formed.

FIG. 1.



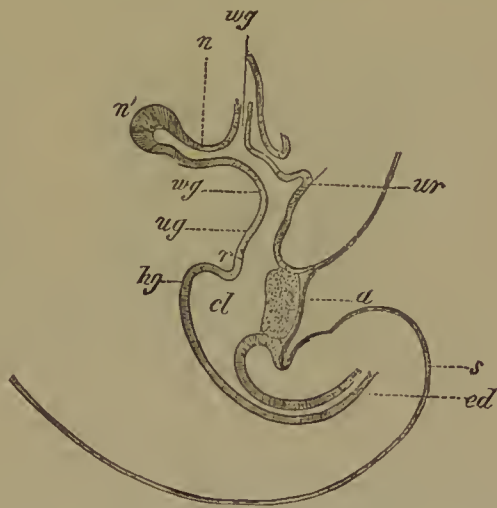
Transverse Section through the Median Part of the Body of the Embryo of a Rabbit of nine days and two hours (enlarged 158 times): *dd*, hypoblast; *dr*, intestinal groove; *ch*, notochord; *ao*, descending aortæ; *uw*, protovertebra; *mr*, medullary tube; *ung*, Wolffian duct; *dfp*, visceral division of the mesoblast; *g*, vessels in the deeper parts of the visceral mesoblast; *hp*, parietal mesoblast; *h*, epiblast; *pp*, pleuro-peritoneal cavity (Kölliker).

In the female embryo of a calf which measured one and a half inches in length Kölliker found the Wolffian duct composed of flat epithelium and a very thin fibrous membrane not yet quite separated from the surrounding tissue. It lay imbedded in a thick layer of blastema, which may be looked upon as the future peritoneal covering of the Wolffian body.

His found it as a cylindrical duct in a very young human embryo, the total length of whose body was only 2.4 millimeters.

While in the male sex the Wolffian duct is destined to play an important part in the adult animal, since in course of time it forms the tail of the epididymis and the vas deferens, in the female sex of man and most animals it disappears more or less completely, yet perhaps not to such an extent as was formerly thought. In the swine

FIG. 2.



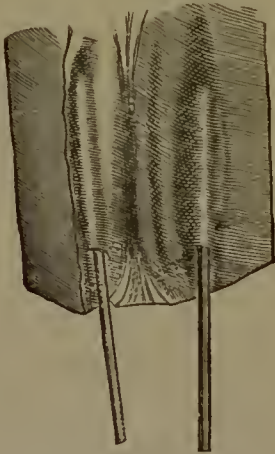
Sagittal Section through the Posterior Part of the Body of the Embryo of a Rabbit of eleven days and ten hours (enlarged 45 times): *wg*, Wolffian duct; *n*, ureter; *n'*, beginning formation of the kidney; *ug*, urogenital sinus; *cl*, cloaca; *hg*, region in which, in the mesial plane, the hind gut opens into the cloaca; *ed*, postanal gut; *a*, anus or fissure of the cloaca; *s*, tail; *r*, perineal fold (Kölliker).

and the cow the Wolffian ducts persist as Gartner's¹ canals, so called after the Danish physician Herman Tresehow Gartner, who discovered and described them in 1822 as a glandular organ, but Malpighi had already described them in the cow in 1681 in his *Dissertatio ad Jacobum Sponium*. The identity of Gartner's canals with the Wolffian ducts was first shown by Jacobson. According to Chevan, these canals run in the cow in the lateral parts of the vagina and extend six or eight centimeters beyond the os uteri. Their posterior end opens in the vulva at the side of the urethral orifice. They are not known to be of any particular use, and nothing similar is found in the goat and the sheep. Kölliker found them as two fine tubules in the anterior wall of the uterus of the female embryo of a cow which measured three inches and four lines.

Milne-Edwards thinks that Gartner's ducts are analogous to the peritoneal tubes of crocodiles. In these animals the upper end opens into the peritoneal cavity; the lower is either closed or opens with a small opening furnished with a valve in the vulva.

Beigel found Gartner's ducts in a female human foetus of seven months' utero-gestation as small epithelial ducts situated laterally and anteriorly in the superficial layers of the uterus. Kölliker found yet distinct remnants of them in the broad ligaments of full-grown human foetuses. Fischel has described a case of a newborn child in which

FIG. 3.



The Urethra laid open by division of its posterior or vaginal wall; the tubules distended by probes (Skene).

FIG. 4.



The Urethra laid open by division of its anterior wall; probes passed into the tubules (Skene).

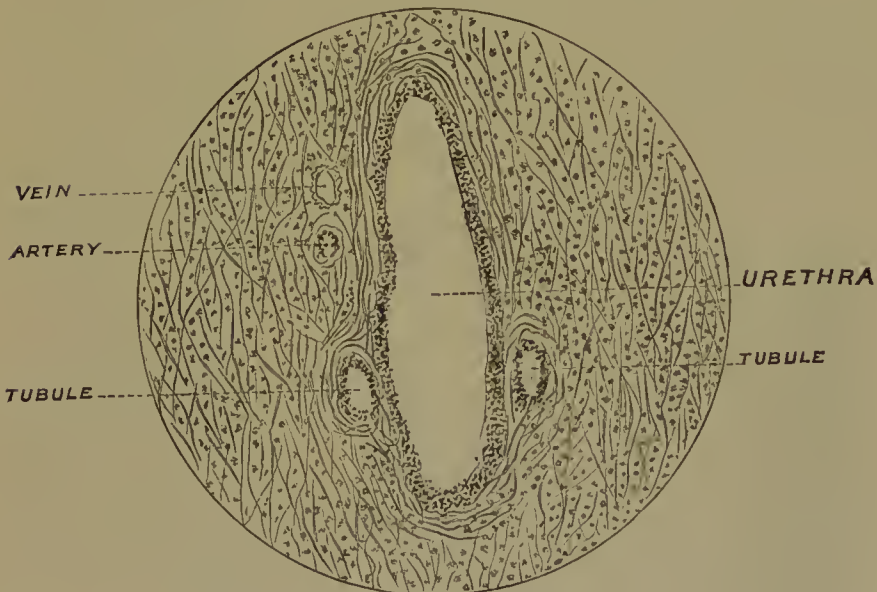
one of these ducts was found in the vaginal portion. Geigel found remnants of them in the wall of the vagina of a four months' foetus, but not in the uterus, and in two foetuses of six months they had totally

¹ The name is almost everywhere erroneously spelt Gärtner or Gaertner.

disappeared. Of late these ducts seem even to have been found quite frequently, by different observers, in the adult woman.

Dr. Skene of Brooklyn, N. Y., described in the year 1880 what he calls "two important glands of the female urethra," which by their position and structure seem to correspond with Gartner's ducts. He says that they are found on each side, near the floor of the female urethra, admit a No. 1 probe of the French scale, and extend upward, parallel to the long axis of the urethra, from three-eighths to three-fourths of an inch in the muscular tissue below the mucous membrane. The mouths of these tubules are found upon the mucous membrane of the urethra, according to the condition of the meatus, either one-eighth of an inch inside, or, if the mucous membrane is everted—which is not uncommon in those who have borne children—exposed to view on either side of the entrance to the urethra. The upper ends of the tubules terminate in a number of divisions which branch off into the

FIG. 5.



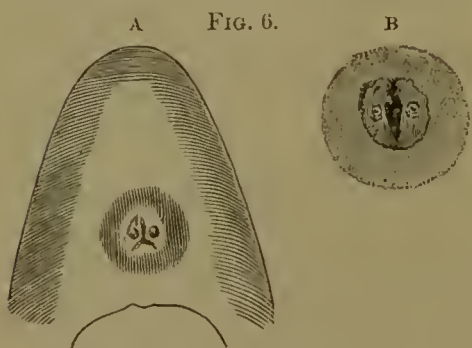
Transverse Section of the Urethra about a quarter of an inch from the meatus, showing the cross-cut of the tubules (Skene).

muscular walls of the urethra. Skene says he has investigated these tubules in more than a hundred different subjects, and found them constantly present and uniform in size and location.

Observations in most respects similar to those of Skene have been made by J. Koeks of Bonn. According to him, these remnants of Gartner's ducts are found in 80 per cent. of women. In newborn children they are relatively larger, but absolutely smaller, than in the adult. In old women they very frequently disappear. Micro-

seopical examination has failed to discover any glandular substance in them.

The observations regarding the persistency of Gartner's ducts have



A, Vestibule of Vulva, with meatus urinarius, the everted mucous membrane showing the entrance to the tubules.

B, Meatus Urinarius, with everted mucous membrane and entrance to the tubules (Skene).

lost somewhat of their apparent reliability by Dohrn's investigations. He has for years examined human embryos with special regard to these ducts, and has come to the conclusion that, as a rule, they soon disappear. According to this author, they are only found, exceptionally, in embryos from the latter half of pregnancy. They reach the uterus at a point which later corresponds to the internal os, and become imbedded in the

outer edge of the womb. In the vagina they are found in the tissue which surrounds the mucous membrane, but lower down they become indistinct, and they disappear totally before they reach the orifice of the urethra. Dohrn thinks that what has been described as persistent

FIG. 7.



A Tubule laid open, and showing the branches at the upper end (Skene).

Gartner's ducts are only folds of the urethra. At the posterior part of the urethral orifice are normally found two such invaginations of the urethra, which extend upward as more or less deep pockets.

Wassilieff, who has described the two tubuliform glandular formations at the entrance of the female urethra in a Russian work in the same year as Skene—that is, two years before the article of Koeks—does not admit the correctness of Dohrn's criticisms. He has repeatedly examined these tubules on sections made after injection with Berlin blue, and found them lined with an epithelium very much like that of the prostate, and entirely different from that in the adjoining part of the urethra.

Carl Rieder found Gartner's ducts only persisting in eight out of forty cases.

From the results of these various investigations we may conclude that Gartner's ducts, *as a rule, disappear in the second half of pregnancy*, but that they exceptionally persist even in the adult woman.

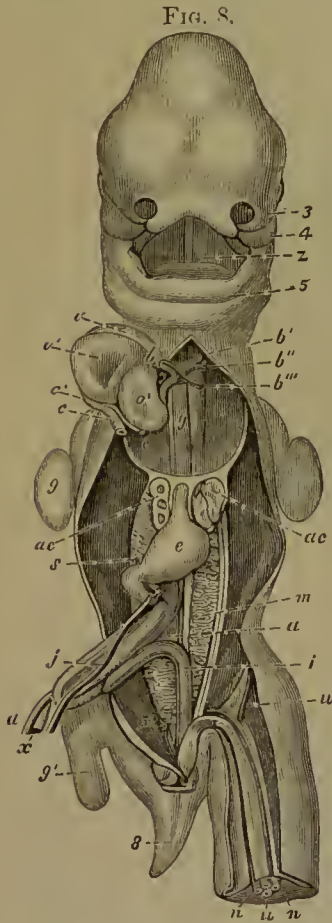
That the upper parts of these ducts occasionally persist, and may give rise to vaginal cysts, there is scarcely any doubt. I have myself examined a cyst of this kind extirpated by Dr. R. Watts of this city,

and both the clinical observation that the cyst at its upper end had a tubuliform continuation through which a uterine sound went up to the iliac fossa, and the histological composition of the sac, which corresponded with that of the vas deferens, determined me to take it to be a dilated Gartner's duct.¹

THE WOLFFIAN BODIES.

Shortly after the Wolffian ducts—in the chicken at the end of the second and the beginning of the third day, in the rabbit on the ninth

and tenth day—appear the so-called Wolffian bodies. His found them in a human fetus of the first month whose body was 2.6 millimeters long. Like the ducts, they are placed symmetrically one on either side of the vertebral column. At the period of their highest development they extend as two long prismatic bodies from the level of the rudimentary diaphragm low down into the pelvis. At their upper end they are bound to the lower surface of the diaphragm by a small filament which Kölliker calls their “diaphragmatic ligament,” and which Waldeyer explains to be the upper end of Müller's ducts, of which we soon shall speak. At their lower end they are fastened to the inguinal region by a filament which Kölliker calls their “inguinal ligament,” and which in the course of time becomes the gubernaculum testis in the male and the round ligament in the female sex. The bodies are bound to the posterior wall of the abdominal cavity by a broad and low mesentery. They are so large that they fill the whole hollow of the posterior wall, leaving only a narrow fissure



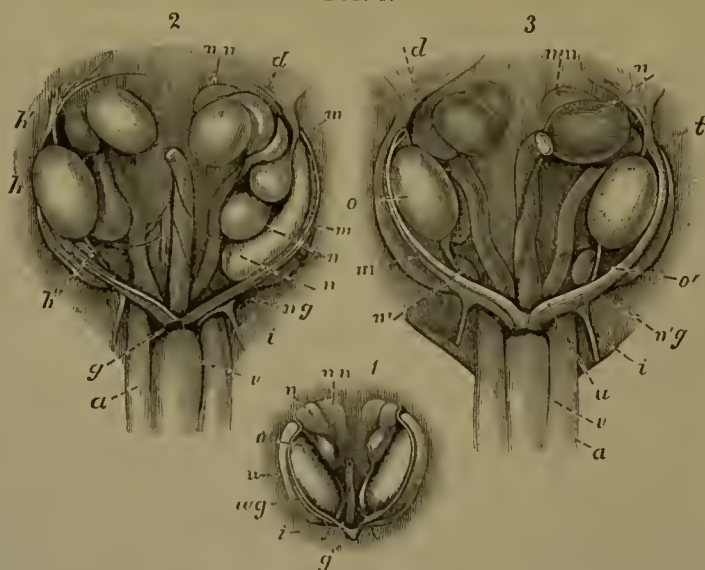
Human Embryo of thirty-five days (front view): 3, left external nasal process; 4, superior maxillary process; 5, lower maxillary process; z, tongue; b, aortic bulb; b', first permanent aortic arch; b'', second aortic arch; b''', third aortic arch, or ductus Botalli; y, the two filaments to the right and the left of this letter are the pulmonary arteries, which begin to be developed; c, the stem of the superior vena cava and right azygos vein; c', the common venous sinus of the heart; c'', the common stem of the left vena cava and left azygos; o', left auricle of the heart; r, right, r', left ventricle; ae, lungs; e, stomach; j, left omphalo-mesenteric vein; s, continuation of the same behind the pylorus, which becomes afterward the vena porta; x, vitello-intestinal duct; a, right omphalo-mesenteric artery; m, Wolffian body; i, gut; n, umbilical artery; u, umbilical vein; 8, tail; 9, anterior, 10, posterior limb. The liver has been removed. The white band at the inner side of the Wolffian body is the genital gland, and the two white bands at its outer side are the Müllerian and the Wolffian ducts (Kölliker, after Coste).

¹ "Trans. New York Obst. Soc.," *Am. Journ. of Obst.*, October, 1881.

on either side. In the inner one of these fissures is later developed the genital gland; in the outer one runs the Wolffian duct, and later likewise the Müllerian duct. Their posterior surface rests on the blastema (in which later the kidneys are developed), on the aorta, and on a large vein which takes up the blood coming from the bodies.

The Wolffian bodies are formed from the lateral plates—or, more precisely, from the cellular lining of the peritoneal cavity—as a long row of small pear-shaped, solid bodies, which soon become separated from the endothelium of the peritoneum and become hollow, in which stage they are called segmental vesicles. These vesicles are in contact with the Wolffian duct, and soon the thin layer which separates the two

FIG. 9.



The Genital and Urinary Organs of the Embryos of Cattle: 1, from a female embryo $1\frac{1}{2}$ inches long (double size): *w*, Wolffian body; *wg*, the Wolffian and the Müllerian ducts; *i*, inguinal ligament of the Wolffian body; *o*, ovary with an upper and lower peritoneal fold; *n*, kidney; *nn*, suprarenal body; *g*, genital cord, composed of the united Wolffian and Müllerian ducts. 2, from a male embryo $2\frac{1}{2}$ inches long (nearly three times natural size): one of the testicles has been removed. Letters as in fig. 1, and, besides, *m*, Müller's duct; *m'*, upper end of the same; *h*, testicle; *h'*, lower ligament of the testicle; *h''*, upper ligament of the testicle; *d*, diaphragmatic ligament of the Wolffian body; *a*, umbilical artery; *v*, bladder. 3, from a female embryo (enlarged nearly three times): letters as in figs. 1 and 2, and, besides, *t*, opening at the upper end of Müller's duct; *o'*, lower ovarian ligament; *u*, thickened part of the Müllerian duct, which later becomes the uterine horn (Kölliker).

cavities is absorbed, so that henceforth the vesicles appear as invaginations from the duct, which as to origin they are not. These grow rapidly, and are transformed into long convoluted tubes, which in the inner part of the Wolffian bodies connect with arterial tufts in a similar way as the uriniferous ducts of the permanent kidneys combine with arterial convolutions to form the Malpighian tufts.

The Wolffian body is in the male developed into the epididymis and

Giraldez's¹ body (Fig. 10). In the female sex these two parts are less prominent. Corresponding to the epididymis we have Rosenmüller's²

FIG. 10.



FIG. 11.

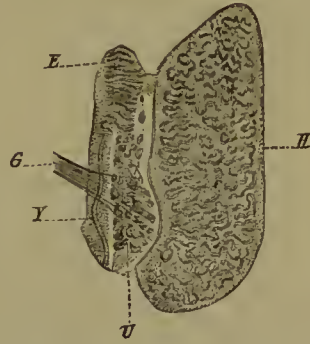


FIG. 10.—Internal Genital Organs of a Female Human Fœtus $3\frac{1}{2}$ inches long (enlarged 10 times): *O*, ovary; *Z*, Fallopian tube; *O.abd.*, abdominal opening of the tube; *E*, epoöphoron (upper part of the Wolffian body); *U*, paroöphoron (lower part of the Wolffian body); *Y*, Wolffian duct, the lower part of which disappears, but its place is marked by thickened tissue that combines with the thickened connective tissue surrounding the tube; *Mp*, Malpighian bodies (Waldeyer).

FIG. 11.—Internal Genital Organs of a Male Human Fœtus $3\frac{1}{2}$ inches long (enlarged 8 times): *H*, testicle; *E*, epididymis (the upper part of the Wolffian body); *U*, paradidymis, or Giraldez's organ (the lower part of the Wolffian body); *G*, bundle of connective tissue with blood-vessels; *Y*, vas deferens (Wolffian duct) (Waldeyer).

organ, or the parovarium, and Giraldez's organ is represented by stray tubes found in the broad ligament between the parovarium and the uterus (Fig. 11). They are filled with epithelial cells and detritus, and often give rise to the formation of eysts. I have frequently seen small eysts situated between the parovarium and the uterus. It is therefore not an improvement when of late years some authors substitute the term "parovarian cyst" for the older term "eyst of the broad ligament." When a eyst forms in any part of the broad ligament and acquires surgical proportions, it will scarcely be possible to prove that it has been developed in the parovarium. The term "cyst of the Wolffian body," on the other hand, would probably be more correct, although there is a possibility that any small agglomeration of cells belonging to the native germ-epithelium, which will be described later, may become the starting-point of an extra-ovarian eyst.

In order to show the homology between the named organs in the two sexes, Waldeyer has proposed to call Giraldez's organ "parepididymis,"

¹ Giraldez, "Recherches anatomiques sur le corps innominé," in Brown-Séquard's *Journ. de l'Anat. et de la Physiol.*, 1861.

² Rosenmüller, *Quædam de ovarii embryonum et fœtuum humanorum*, Lipzizæ, 1802.

or, shorter, "paradidymis," Rosenmüller's organ "epoöphoron,"¹ and the tubules between this organ and the uterus "paroöphoron."²

THE OVARIES.³

The sexual glands are originally entirely alike in the two sexes. They make their first appearance very soon after the Wolffian bodies—in the chicken on the fifth day, in the rabbit on the twelfth or thirteenth, in man in the fifth or sixth week. In the latter they begin as a white streak, called "the genital ridge," on the inner side of the Wolffian bodies. This streak extends almost as far as the bodies themselves, and is in close contact with them. How it is formed in man is not known, but in chickens the process has been studied step by step. In these animals the genital glands originate as a thickening of the epithelium of the inner part of the Wolffian bodies. This part of the peritoneal epithelium differs from the other by being composed of columnar cells, and as it forms the substance of which the Fallopian tubes, the ovaries, and the ova are formed, Waldeyer has designated it as the "germ-epithelium" (*Keimepithel*).

It is not before the end of the second month that the ovaries begin to differ from the testicles in man, the latter becoming broader and

FIG. 12.



Perpendicular Section through the Ovary of a Human Fœtus of thirty-two weeks (Hartnack, ?): *a*, epithelium; *b*, *b*, cells in the epithelium which become primordial ova; *c*, prolongations of connective tissue growing into the epithelial layer; *d*, *d*, cluster of epithelial cells in the process of being imbedded; *e*, *e*, primordial follicles with a wall formed of narrow connective-tissue cells; *f*, groups of imbedded epithelial cells, some of which are larger than the others (primordial ova); *g*, granular cells (His).

shorter, while the former retain their lengthy shape, and in the ninth or tenth week take a more oblique direction.

Another early sign of distinction between the testicles and the

¹ Ἐπὶ, upon; ὠδόν, egg; φέρω, I carry.

² Παρὰ, beside.

³ Latin, *ovum*, egg.

ovaries is that the latter have a much more developed columnar epithelium. In the chicken this difference is present as early as the end of the first week.

Even before the distinction between the sexual glands takes place they are fastened to the Wolffian bodies by means of a small fold of the peritoneum, which, according to the sex, is called "mesorchium" or "mesoarium." From the upper end of the reproductive gland a small ligament runs to the diaphragmatic ligament of the Wolffian body, and the lower end is bound by another ligament to the Wolffian duct opposite the starting-point of the inguinal ligament of the Wolffian body (Fig. 12).

FIG. 13.



Perpendicular Section through the Ovary of a Bitch of six months (Hartnack, ?): *a*, epithelium; *b*, epithelial pouch, opening on the surface; *c*, larger group of follicles; *d*, ovarian tube containing ova; *e*, oblique and transverse sections of ovarian tubes (Waldeyer).

Originally both ovaries have about the same size, but from about the fifth month of gestation the left ovary is left considerably behind as to development. In the eighth week their length is 2.5 to 3 millimeters (Puech). Meyer furnishes the following figures as indicating the length of both ovaries of human fœtuses at different periods, the figures being the average of several measurements:

Age in weeks.	10.	15.	20.	24.	28.	32.	36.	40.
Length of the ovaries { right	3.8	5.0	11 $\frac{3}{4}$	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{3}{4}$	16 $\frac{1}{2}$	20 $\frac{1}{2}$
in millimeters { left	3.7	5.0	12	11	12 $\frac{3}{4}$	13 $\frac{1}{2}$	13 $\frac{1}{2}$	17 $\frac{1}{2}$

Puech mentions likewise the greater length of the right ovary, but the average difference in forty cases was only about one and a half millimeters, the average length of the right being 19.8 millimeters; of the left, 18.2.

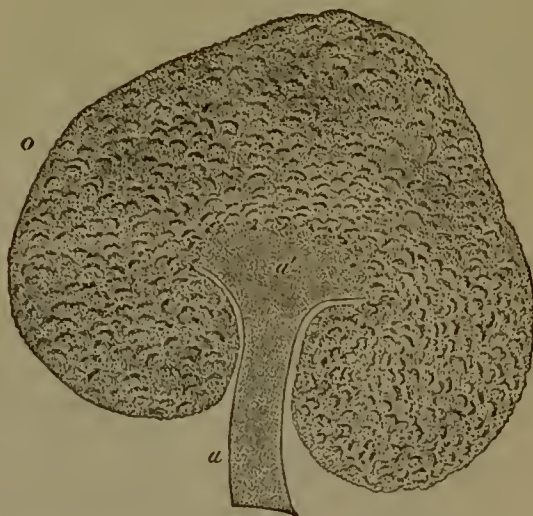
During the first two-thirds of gestation the uterus and the ovary keep almost equal pace as to size, but from the end of the seventh

month the uterus increases much more rapidly. In the following list, taken from Meyer, the length only is considered, and that of the ovaries is the average found for the two :

	Uterus.	Ovaries.
10th week	— mm.	3.8 mm.
15th "	5½	5
20th "	9½	12
24th "	11½	11¾
28th "	12½	13½
32d "	19	15¼
36th "	24	15
40th "	28	19

The shape of the ovary varies very much at different periods. At first it is a long flat body ; later it grows, especially at the edges, so that a cross-section presents the figure of a bean or a mushroom, as in Fig.

FIG. 14.



Transverse Section through the Ovary of a Human Embryo of three months (enlarged 43 times); *a*, mesoarium; *a'*, stroma of the hilus (medullary substance); *b*, glandular tissue (cortical substance) (Kölliker).

14. About the middle of gestation the lips at the hilus disappear, and the line of insertion of the mesoarium approaches the lower and posterior edge, so that a cross-section presents a pear-shaped appearance. In the foetus as well as in the infant the surface of the ovaries shows impressions of the surrounding organs. It is first at the end of the second year that the organ has become resistant enough to maintain an even surface independent of the contiguous parts.

The ovary is subject to a descent similar to that of the testicle. It takes place soon after the tenth or eleventh week, so that the ovary at the end of the fifteenth week is found almost in the same place as later.

Yet even in newborn children and shortly after birth we find the ovaries situated above the ileo-pectineal line. As a rule, the ovaries descend into the true pelvis during the first two or three months after the birth of the child (Kölliker). The descent consists chiefly in a change of direction, and not in a true change of the distance between the ovaries and the uterus. At the earliest period the lower end of the ovary is found opposite the starting-point of the round ligament of the uterus. Most of the apparent descent is due to a disproportion in the growth of the parts situated above and below the ovaries. The shrinking of the round ligaments, which are composed of cellular elements and much fibrillar tissue—a shrinking analogous to that which takes place in eieatrial tissue—seems likewise to be at work, but to be of subordinate importance. By the change in direction referred to the upper end turns outward and sinks considerably downward; the lateral edge becomes the superior or free edge; the mesial edge becomes the lower; the ventral or anterior surface is turned inward to the mesial line; the dorsal or posterior surface is turned outward to the side of the pelvis (Kölliker).

The relations to the Fallopian tubes are changed in such a way that the ovary, instead of being situated on the inner or mesial side of the Müllerian duct, finally lies behind and below the Fallopian tube. The right ovary is from the tenth week of gestation placed lower and nearer the uterus than the left.

At the upper end of the foetal mesoarium enter the ovarian vessels from the posterior abdominal wall, and extend downward, enclosed in a particular fold of the peritoneum, which exhibits a free lateral edge and in course of time becomes the infundibulo-pelvic ligament, extending from the fimbriated end of the Fallopian tube to the side wall of the pelvis.

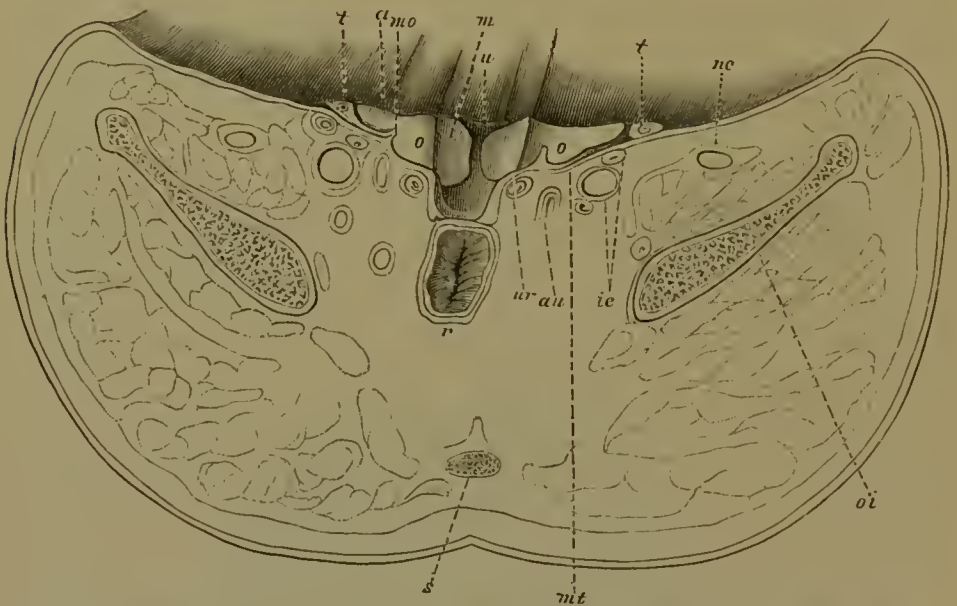
To the lateral side of the mesoarium is attached the mesosalpinx, or mesentery of the Fallopian tube. In older embryos it is stretched out behind the ovary as a fine membrane, the free outer edge of which surrounds the Fallopian tube. In a previous stage this membrane formed the peritoneal covering of the Wolffian body, and contains the remnants of this body, especially the parovarium.

The inner (lower, anterior) end of the ovaries is bound to the uterus by means of the ovarian ligament, which is a continuation of the mesoarium. At the middle of gestation these inner ends lie pretty near one another. They rest on the ureters and the umbilical arteries, while the outer (upper, posterior) part of the ovaries is placed in front of the external iliac vessels. The broad ligament cannot be said to exist yet, the uterus filling the whole cavity of the true pelvis. What starts from its sides is nothing but the already-mentioned formations—namely, the mesoarium, the mesosalpinx, and the round ligament; which latter, as

we have seen above, is originally a ligament belonging to the Wolffian body, and only enters into connection with the uterus after the destruction of those bodies.

While the tubes, and likewise that part of the uterus which is situated in the peritoneal cavity, are covered all over with peritoneum, the

FIG. 15.



Transverse Section through the Ovarian Region of a Human Embryo of five months, lower surface seen from above (enlarged 3 times): *oi*, os ilium; *s*, sacrum; *mo*, mesoarium and the hilus of the ovary, bounded by two lips; *o*, ent surface of the ovary; *n*, free ventral surface of the ovary or lateral part of the ventral surface; *t*, tube; *ml*, mesentery of the tube (later the ala vespertilionis); *r*, rectum; *ur*, ureter; *au*, umbilical artery; *ie*, external iliac vessels; *nc*, anterior crural nerve (Kölliker).

ovaries are, as it were, lodged in two holes of the peritoneum. Only quite near the hilus have they a sheath of that membrane.

The formation of the ova and Graafian follicles¹ has especially been elucidated by Waldeyer, and his views have with slight modifications been corroborated by H. Meyer, the most recent investigator of the subject, and by Allen Thomson. At the earliest stage we have seen the ovary to be represented by a streak composed of cells developed from the peritoneal covering of the Wolffian body. Very soon a protuberance of connective tissue makes its way from behind into this cell-heap. These two different parts are the beginning of the two substances which go to build up the ovary, the connective tissue forming the stroma; the cells, the parenchyma or glandular part; but in the ensuing development these two elements become most intimately interwoven. The stroma sends out between the cells prolongations which separate them into groups, and grow together over them, so as

¹ Regnier de Graaf, *De Mulierum organis generationi inservientibus*, Leyden, 1672.

to form a layer of connective tissue above them ; but simultaneously new layers of cells are formed outside of the first border-line, which

FIG. 16.

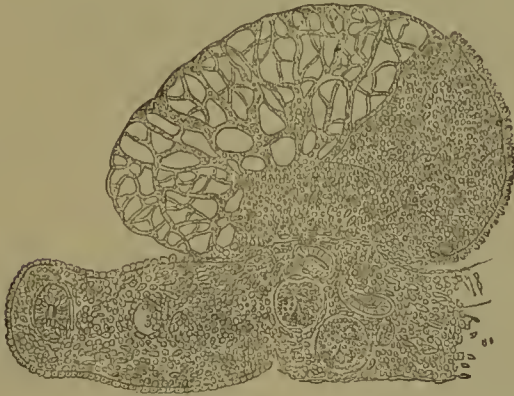


FIG. 17.



FIG. 16.—Ovary of a Human Fœtus of ten or eleven weeks: *a*, superficial stratum of cells; *b*, layer of connective tissue; *c*, trabeculæ of connective tissue, the cells having been removed; *d*, mesoarium (Meyer).

FIG. 17.—Part of the same Ovary, near the surface, seen with higher power: *n*, natural size of the ovary.

again become divided into groups by new prolongations of the stroma. The chief direction of these prolongations is a radial one from the hilus

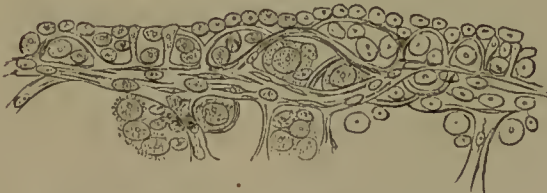
FIG. 18.



From a Fœtus of sixteen weeks. The formation and separation of ova (Meyer).

to the surface. At an earlier stage they are entirely irregular, and do not form closed cavities, but an irregular system of meshes and anas-

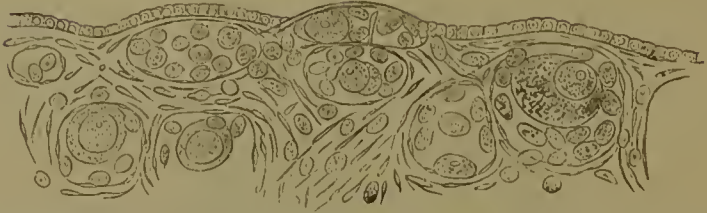
FIG. 19.



From a Fœtus of twenty-eight weeks. In some places is already seen the permanent epithelium, composed of a single layer (Meyer).

tomosing tubes, much like those seen in a sponge. At the surface is a particular zone composed of several layers of cells, between which are

FIG. 20.



From a Fœtus of thirty-six weeks. The single epithelial layer is interrupted by the intercalation of a belated primordial ovum with its follicular epithelial cells (Meyer).

FIG. 21.

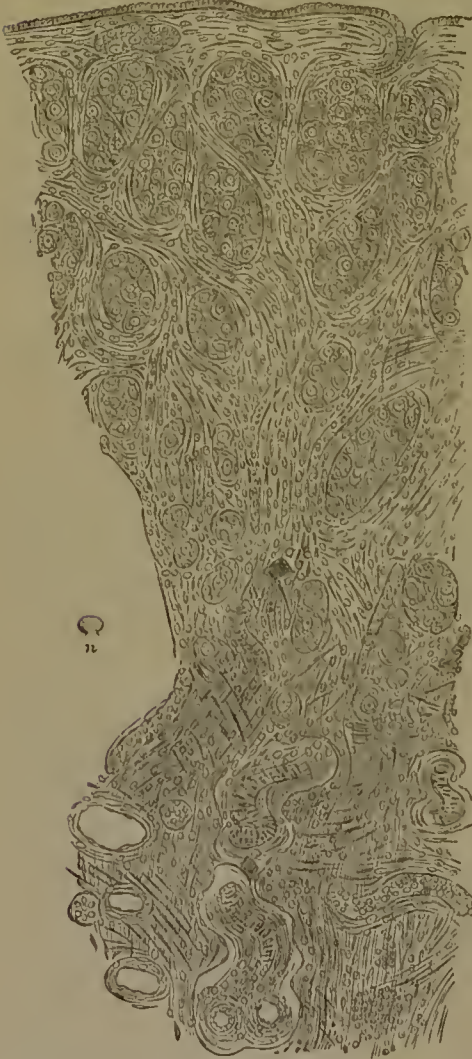
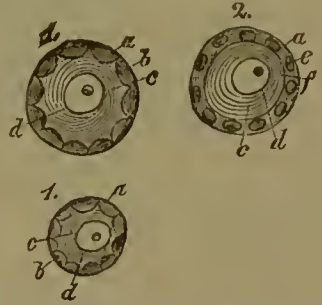


FIG. 22.



Three Graafian Follicles from the Ovary of a Newborn Girl (enlarged 350 times): 1, natural condition; 2, treated with acetic acid; a, structureless membrane of follicles; b, epithelium (*membrana granulosa*); c, yolk; d, germinal vesicle, with germinal macula; e, nuclei of the epithelial cells; f, vitelline membrane (very fine) (Kölliker).

found fine prolongations from the stroma; and this zone is separated from the rest of the parenchyma by a fine layer of connective tissue (Fig. 16).

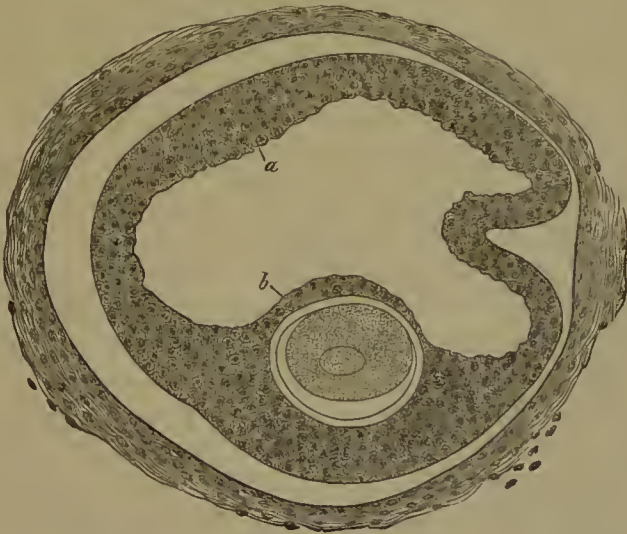
From the end of the sixth month the surface begins, in some places, to form a single layer of epithelial cells (Fig. 19), and in the newborn girl the whole ovary is covered with such a single layer of low columnar cells, under which lies a more or less thick layer of connective tissue, the so-called albu-

Part of Section from surface to hilus of Ovary from Girl three days old: single layer of epithelium yet in connection with a cluster of primordial ova. All ova have disappeared from the surface. A broad layer of stroma separates in most places the epithelium from the follicular zone. The farther we go from the surface toward the hilus, the fewer ova are there in one nest, until finally there is only one in its primary follicle. n, natural size of the whole ovary (Meyer).

ginca (Fig. 21). This is by no means a separate membrane, but only a somewhat denser part of the ovarian stroma. (Figs. 18–20 show the gradual change of the surface.)

In the mean time the prolongations extending from the hilus to the surface have grown in thickness, length, and width, and new prolongations have grown from the walls of the older meshes, dividing the cell-groups into smaller and smaller compartments, until finally one large cell with one or more smaller ones is entirely enclosed in a cavity formed by the stroma (Fig. 20). These large cells, containing a large nucleus, are the future ova, and are called primordial ova. The compartment in which they are found imbedded with the small epithelial cells are called primary follicles (Figs. 18, 19). The smaller cells increase in number and form several layers. A fissure appears between these layers, and a liquid accumulates in the interstice, forming the beginning of the liquor folliculi. The outer layers form the epithelium of the Graafian follicles, the so-called *membrana granulosa*; the inner continue to surround the ovum and form the *discus proligerus*, or, as

FIG. 23.



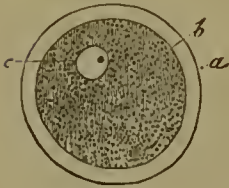
Graafian Follicle from a Girl seven months old (enlarged 220 times; natural size, 0.351 mm.): *a*, epithelium (*membrana granulosa*) detached from the fibrous membrane; *b*, *discus proligerus* or *cumulus ovigerus*, situated far away from the surface. It contains the ovum, on which the *zona pellucida* and the *germinal vesicle* are visible. The surrounding fibrous membrane of the follicle is not yet separated into two layers, and there is no distinct line of demarkation between it and the stroma (Kölliker).

Kölliker more graphically designates it, the *cumulus ovigerus*—*i. e.* the heap containing the ovum (Fig. 23). At what time this formation of the true Graafian follicles normally takes place is not yet decided. Some have found them in the newborn child, others only after the age of two years and a half.

At first the primordial ovum is a simple protoplasmic body without any membrane, the zona pellucida (Fig. 24) appearing after the formation of the Graafian follicle is completed.

The fibrous membrane of the follicle is formed by a differentiation of the surrounding stroma. After the completion of the follicles they can easily be enucleated from the surrounding stroma, showing that the connection with the latter has been loosened. This seems to be due to the formation of numerous lymph-spaces in the connective tissue surrounding the fibrous membrane of the follicles.

FIG. 24.



Human Ovum from a medium-sized Follicle (enlarged 250 times): *a*, vitelline membrane, or zona pellucida; *b*, limit between the yolk and the zona pellucida; *c*, germinal vesicle with germinal spot (Kölliker).

As here described, the ova, the surface epithelium of the ovaries, and the epithelium lining the inside of the Graafian follicles have all one and the same origin; but it might be proper to add that while all observers have corroborated Waldeyer's doctrine as to the formation of the ova, there obtains some difference of opinion as to the origin of the epithelium of the follicles, the so-called *membrana granulosa*. While Waldeyer gives it the same origin as the ova—namely, the germ-epithelium covering the surface of the ovaries—Foulis believes it is formed from the stroma of these glands. According to Kölliker, the process is much more complicated. In that part of the ovary which is situated nearest to the hilus are found cords composed of small cells and canals lined with columnar epithelium, which, like several other microscopists, Kölliker takes to be remnants of the Wolffian body. But he has found that these so-called medullary cords come in contact with the primordial ova which are exclusively found in the more superficial layers of the ovary, and, according to him, they surround these ova and furnish the *membrana granulosa* of the Graafian follicle.

The great simplicity of Waldeyer's theory, and new observations in lower animals by other embryologists, would seem to give that theory the preference, according to which the epithelium of the follicle and the ovum which it encompasses are derived from the same source; and recently this view has been corroborated by the investigations of Meyer in human embryos.

It is very likely, although not yet positively proved, that the cells which are destined to become ova after being surrounded by stroma multiply by division. This would constitute a second source of the enormous number of ova contained in the ovaries, which has been evaluated by Henle to thirty-six thousand in each gland (Fig. 25).

The formation of ova on the surface of the ovaries ceases almost entirely from the time they are covered with a single layer of epithelium—that is to say, about the end of the seventh month—but it is

not unlikely that the formation of new ova by division may go on much longer.

From the time of the birth of the child to that of puberty the ovaries simply grow in size and become smoothed and rounded off. In children from six to eleven years old the average measures of the right ovary are—length, 26.7 millimeters; height, 9.0; thickness, 4.4; the left, length, 24.0; height, 8.4; thickness, 4.6. In girls of thirteen to fourteen years the average measures are—right ovary, length, 29.6; height, 15; thickness, 10; left, length, 25; height, 14; thickness, 9.3 (Puech). At the age of puberty a new life begins in the organs by the periodical development and rupture of the Graafian follicles, by which the ova are set free. (For the particulars of this process we refer the readers to works on physiology and anatomy.)

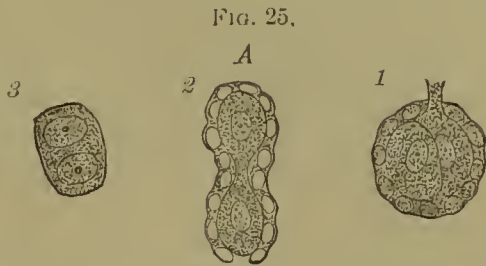


FIG. 25.
A
From a Human Embryo of six months (enlarged 400 times); 1, two primordial ova surrounded by a common layer of epithelium, one of which has a prolongation by means of which it probably was attached to another ovum, as in 2, where two primordial ova are linked together by means of a band of protoplasm, the whole surrounded by one epithelial layer. 3, primordial ovum with two nuclei (germinal vesicles) (Kölliker).

THE MÜLLERIAN¹ DUCTS.

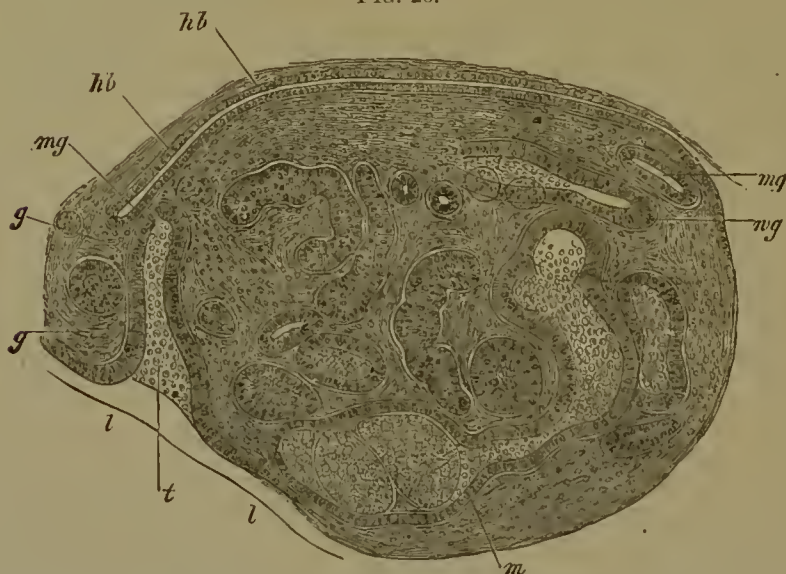
In no part of our study of the development of the female genitals are we more forcibly reminded of the yet unsettled condition of embryology than in regard to the Müllerian ducts—an uncertainty which is explainable when we remember that these investigations are of a comparatively recent date, that different observers sometimes have worked on the embryos of different animals, and that gradually new and improved methods have been adopted in the preparation of the specimens. As heretofore, we will chiefly follow Kölliker, the author of the most complete work on human embryology in any language. According to this authority, Müller's ducts appear shortly after the Wolffian bodies—in chickens on the sixth day, in rabbits on the twelfth or the thirteenth day. They begin as a funnel-shaped invagination from the germ-epithelium at the inner side of the upper end of the Wolffian bodies, on a level with the fifth protovertebra (Fig. 26). From this locality the Müllerian duct extends behind the Wolffian body to its outer part, where it lies close up to the Wolffian duct, outside of this latter duct; but gradually the Müllerian duct turns spirally round the Wolffian duct, so as to come in front of it, then inside of it, and finally behind it. The lower end is in young embryos

¹ Johannes Müller, *Handbuch der Physiologie der Menschen*, Coblenz, 1834 *et seq.*

formed of a solid mass of cells, in which subsequently a canal appears. In the chicken this whole development is finished in the course of two days, when the duct opens into the cloaca. In the rabbit the development takes considerably longer time, probably nineteen or twenty days. In human embryos the perforation takes place in the seventh week. This is the origin of the Müllerian ducts as observed by Bornhaupt, Egli, and Kölliker in the chick and the rabbit.

Waldeyer, on the other hand, who has investigated the matter in chickens, pretends that the duct is formed from the germ-epithelium as

FIG. 26.



Transverse Section through the upper end of the Wolffian Body of the Embryo of a Rabbit of 14 days (enlarged 140 times): *wg*, Wolffian duct; *m*, connection between a tubule of the Wolffian body with a Malpighian body; *t*, entrance to the Müllerian duct (later the abdominal ostium of the Fallopian tube); *g, g'*, mesentery of the Wolffian body, containing a glandular tubule; *l, l'*, surface of the liver; *hb*, posterior abdominal wall; *mg'*, lateral part of the Müllerian duct (Kölliker).

a canal which, at first open, becomes gradually closed by the fusion of the borders, so as to form a closed tube.

A third view is that put forth by Balfour and Sedgwick. According to these authors, Müller's duct is at first a solid string of cells which becomes detached from the outer wall of the Wolffian duct.

The Müllerian duct has a mesentery of its own, which is first attached to the Wolffian body. After the absorption of that organ it is fastened to the posterior abdominal wall, and at a still later stage we find it starting from the outer surface of the mesoarium, as described above in speaking of the ovary.

If thus the origin of the Müllerian ducts is still somewhat uncertain, their further development and ultimate fate are well known. In the male sex they disappear very soon almost entirely. In the male

embryo of a rabbit of twenty-three days' gestation Kölliker found no trace of them. In the chicken they disappeared likewise completely after the twelfth day. In some animals, such as the ruminants and the Carnivora, some remnants of them are found as vesicular formations at the fundus of the bladder. In man the whole central part of them is absorbed. The upper end is left, and forms the small vesicle attached to the epididymis which is called Morgagni's hydatid. The lower end likewise remains, and forms the vesicula prostatica, which corresponds to the uterus and vagina. While in the male sex only vestiges, without any physiological importance, are left of the Müllerian ducts, in the female they become the ducts through which the ovum passes from the ovary, the receptaculum in which the foetus is developed, and the tube in which sexual connection takes place, and through which the offspring is brought out to separate existence.

THE FALLOPIAN¹ TUBES.

These organs are a development of that part of the Müllerian ducts which is situated above the round ligament. In the course of time it increases in size; it changes direction in following the ovary down, and comes to occupy a position above and in front of the latter organ; the muscular coat and mucous membrane are developed, and around the opening at the upper outer end sprouts out the row of tongue-like prolongations constituting the fimbriæ.

THE UTERUS² AND THE VAGINA.³

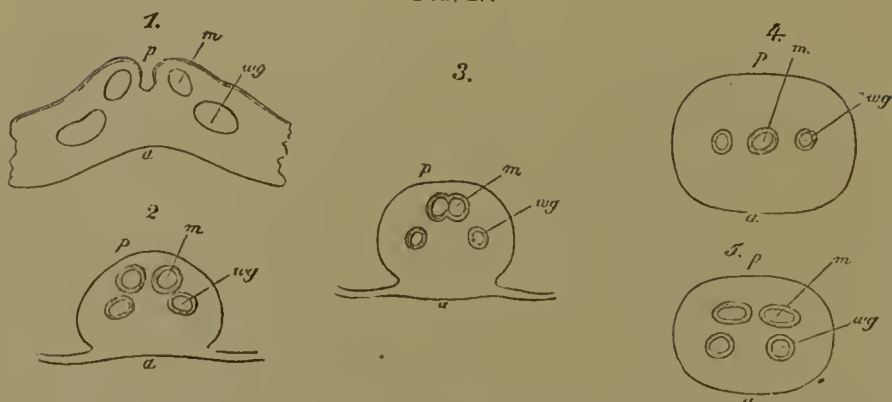
That part of the Müllerian ducts which is situated below the insertion of the round ligament and the lower ends of the Wolffian ducts enter into close connection and form a quadrilateral cord with rounded-off edges, the so-called genital cord. (See Fig. 27.) Cross-cuts through this cord show that at the upper and lower ends there are four epithelial tubules, the Müllerian ducts lying behind the Wolffian ducts; but in the intermediate part the two Müllerian ducts are seen growing or grown together, so as to form one single tube, which is the first appearance of the uterine cavity. From pathological specimens Schatz has inferred that the fusion begins just below the place where later the vaginal portion will be situated. This fusion of the Müllerian ducts takes place in the human embryo at the end of the second month. As the whole of the genital cord is used to build up the uterus and the vagina,

¹ Gabriele Fallopio, *Observationes anatomicae*, Venet., 1561.

² Classic Latin name for the womb, but in ancient times comprising the whole genital tract.

³ Classic Latin, meaning a sheath.

FIG. 27.



Transverse Section through the Genital Cord from the Embryo of a Cow $2\frac{1}{2}$ inches long (enlarged 14 times): 1, from the upper end of the cord (the ducts have been cut somewhat obliquely); 2, somewhat lower down; 3 and 4, from the middle of the cord, showing incomplete and complete fusion of Müller's ducts; 5, from the lower end, showing the two Müllerian ducts separated; a, anterior; p, posterior side of the genital cord; m, Müller's duct; wg, Wolffian duct (Kölliker).

the lower parts of the Wolffian ducts contribute their share to the formation of these organs. In the third month the uterus is still two-horned; that is to say, those parts of the Müllerian ducts which lie nearer

FIG. 28.



FIG. 29.



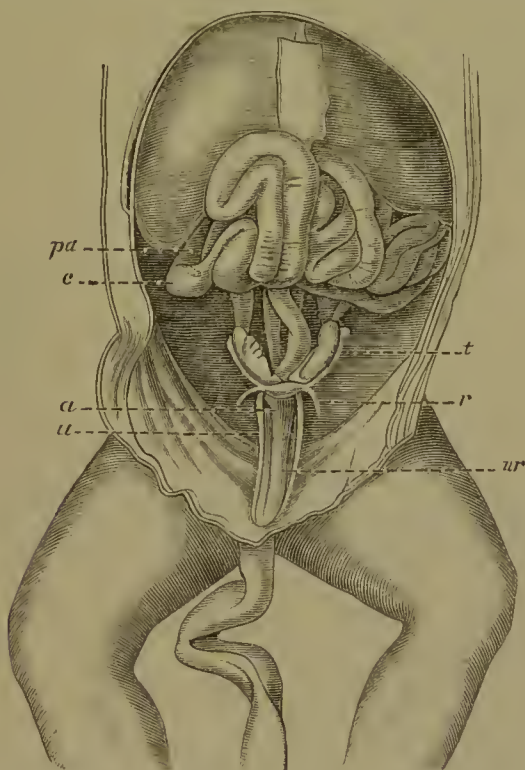
Ovaries, Tubes, and Uterus from a Human Fœtus from the tenth week, 26 mm. long (Fig. 28 natural size; Fig. 29, enlarged four times): a, the round ligament; b, rectum (Meyer).

the round ligaments are not yet united. (See Figs. 28 and 29.) As just stated, the fusion begins in the middle, while the ducts are still separated above and below. The upper parts constitute the horns of the uterus, which persist in many animals, but in woman gradually grow together, the partition between them becoming absorbed, until finally, about the middle of pregnancy, the uterus forms one sac without horns, as seen in Fig. 30, and containing a single cavity. The lower parts later become fused together, except when, by an arrest of development, they persist as two and form a double vagina—a point to which we will come back in treating of malformations.

The Müllerian ducts open into the lower part of the urachus—*i. e.* that part of the allantois which is comprised in the body of the embryo and forms the bladder (Fig. 31). This lower part, from the openings of the Wolffian and Müllerian ducts downward, is called the sinus urogenitalis (Fig. 2, p. 69). Originally, it opens into the cloaca, a common vault, in which end the urogenital system and the intestine (Fig. 31), and which communicates with the surface through the cloacal opening formed by an invagination from the epiblast and thinning

of the tissue intervening between it and the gut. This perforation takes place in the human embryo in the fourth week. In the course

FIG. 30.



Abdominal and Pelvic Viscera of a Female Embryo of five months (length, from vertex to sole, 19 centimeters—natural size): *t*, tube; *r*, round ligament; *v*, bladder; *u*, umbilical artery; *ur*, urachus; *c*, caecum; *pa*, vermiform appendix (Kölliker).

of the sixth and seventh weeks the common orifice is seen to become divided into two parts—viz. the longer slit of the genito-urinary aperture anteriorly, and the narrower and more rounded anal opening posteriorly.

This separation of the single cloacal opening into two is probably mainly effected by the growth of tissue from the sides of the cloaca and downward from the point where the rectum and the urachus unite. By the formation of this septum the sinus urogenitalis is separated from the rectum (Fig. 32). This partition unites with the posterior end of

FIG. 31.



FIG. 31.—*cl*, cloaca; *all*, allantois; *m*, Müller's duct; *r*, rectum (Schroeder).

FIG. 32.



FIG. 32.—*su*, sinus urogenitalis; *r*, rectum, separated by the perineum; *v*, vagina, lower part of Müller's duct; *b*, bladder; *u*, urethra (Schroeder).

the genital folds (see Fig. 34), and thus the separation between the genito-urinary and the anal openings is completed by the formation of the perineum, which takes place in the tenth week.

The sinus urogenitalis lags behind in growth, while the urethra is being formed as a distinct part, different from the bladder, with which it hitherto has been blended into one organ, the urachus, and the uterus and vagina are being developed from the lower part of the Müllerian ducts. (See Fig. 33, 2.) Actual measurements at different stages of development prove that the sinus urogenitalis increases in size, so that its apparent diminution is only due to the comparatively greater development of the surrounding parts. In consequence of the considerable

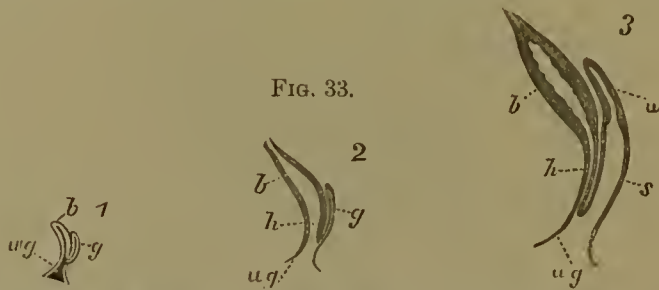


FIG. 33.
Sinus Urogenitalis and its Appendages from Human Embryos (in life-size) : 1, from a three months' foetus ; 2, from a four months' ; 3, from a sixth months' ; *b*, bladder ; *h*, urethra ; *ug*, sinus urogenitalis ; *g*, genital canal, common rudiment of vagina and uterus ; *s*, vagina ; *u*, uterus (Kölliker).

growth of the vagina the sinus urogenitalis, which at an earlier stage appeared to be the continuation of the bladder, becomes the direct continuation of the vagina and forms the vestibule.

At first the uterus and the vagina form only one organ, without any line of demarkation between the two, as seen in Fig. 33, 1 and 2, representing embryos of the third and the fourth month. In the fifth, and still more distinctly in the sixth month, the uterus becomes separated from the vagina by the formation of a ring protruding from the inner surface at the level of the future external os (see Fig. 33, 3); which ring, by further development during the remaining months of pregnancy, becomes the vaginal portion.

In the fifth month the uterine wall is scarcely thicker than that of the vagina, but from the sixth month it increases considerably in thickness. Transverse folds appear in the fifth month, designating the cervix.

In the newborn child the cervix constitutes about two-thirds of the whole length of the organ, and its walls are much thicker than those of the body. In a specimen lying before me the exact outer measures are—cervix, 2.2 centimeters ; body, 1.0 ; wall of cervix, 0.3. On the outer surface there is no distinct line of demarkation between the cervix and the body. The lower part forms a cone the base of which points down toward the vagina, and the shape of which is such that a cross-cut made perpendicularly on the long axis almost forms a circle. The body, on the other hand, has the shape of a flattened cone, the basis

of which is turned upward to the abdominal cavity ; but this triangular flat part extends somewhat lower down than the internal line of demarkation between the cervix and the body, and on the anterior surface the peritoneum descends almost as far down below the internal line of demarkation (nine millimeters) as the whole length of the body. On the internal surface the line of demarkation is very sharp on the anterior surface. The anterior column, from which numerous rugæ go off to both sides under acute angles tending outward and upward, ends abruptly at a deep transverse furrow which separates it from the cavity of the body. The whole anterior surface of the cavity of the body, from this furrow up to the fundus, is occupied by two large bundles of longitudinal furrows, each of which forms a lengthy, narrow triangle, touching the fundus with their base. A similar formation is found on the posterior wall, but here the line of demarkation between the transverse folds of the cervix and the longitudinal folds of the body is less distinct. In both edges of the cavity of the body is found a fine longitudinal ridge from which start to both sides fine transverse folds ending at the longitudinal folds on the anterior and posterior surfaces. They are a direct continuation of the transverse folds found in the cervix.¹

Later in life all these folds of the cavity of the body disappear. In a figure in Courty's treatise of the diseases of the uterus, representing the normal uterus of a girl of seven years, the folds are already limited to the cervix. The fundus in the newborn forms a straight line from one tube to the other. The whole organ is slightly curved forward, but there is no anteflexion ; that is to say, the axis of the organ does not form any angle. According to Kölliker, some uteri from the end of embryonic life, and during childhood up to the age of puberty, present a slight degree of anteflexion. After that time the normal uterus is straight.

The mucous membrane of newborn children has no true glands, but only follicular depressions.² The formation of glands begins much earlier in the cervix than in the body. Thus in the body of the uterus of a girl of six or seven years there are barely found at long intervals some epithelial invaginations which only penetrate to a short distance into the stroma of the mucous membrane, constituting rudimentary glands. At the same time, those of the cervix are perfectly developed, and have even almost acquired the size they obtain in the adult (De Sinéty). It is true that even in the newborn child we find the cervical canal filled with a thick colorless mucus, as in the adult, but this is

¹ This description of the cavity of the uterus with *longitudinal* folds differs entirely from the common one, according to which the transverse folds of the cervix should be continued on the anterior and posterior wall up to the fundus ; but on the other hand, it comes pretty near to the description, and especially the drawing, of Hagemann, who injected the cavity with a soft metallic composition or paraffin.

² Cornil, *Journal de l'Anatomie*, 1874, quoted by Imbert.

merely a secretion from the calciform or cup-shaped epithelial cells found on the folds of the cervix. During the years elapsing between the birth of the child and its arrival at puberty the uterus stays much behind the rest of the body in development—so much so that in a girl of ten or twelve years it scarcely differs in external appearance from that of a newborn child (Puech). But at the time of approaching menstruation the organ increases much in size—an increase which goes on till the general growth of the body reaches its maximum.

The *vagina*, after the differentiation between it and the uterus has taken place in the fifth month, becomes much wider than the uterus, and about the middle of utero-gestation its folds make their appearance.

The *hymen*¹ is not, as stated in most books, a mere fold of the mucous membrane of the vagina, but, as demonstrated by dissections made by Budin, the whole lower end of this canal dipping into the vestibule. It is only a further development of the ring-shaped swelling with which the Müllerian ducts are surrounded where they open into the sinus urogenitalis. This development does not begin before the nineteenth week. As a rule, a larger part of the posterior wall protrudes than of the anterior. The internal or upper surface shows a continuation of the vaginal columns and folds. The vagina in young individuals has the shape of the finger of a glove, with a small round opening or lengthly slit at the end, which is the true entrance of the vagina.

THE VULVA.²

As stated above, at an early stage of embryonic development the intestine and the bladder open into a common space called the cloaca, which from the fourth week communicates with the outer surface by means of an aperture called the primitive anal or cloacal opening. In front of this opening there appears in the sixth week a protuberance called the genital eminence, and soon thereafter two lateral folds called the genital folds (Fig. 34). The genital eminence protrudes more and more, and toward the end of the second month a furrow appears on its lower surface extending to the outlet of the cloaca, the so-called genital furrow. From the fifth to the tenth week the cloaca becomes separated, as described above, into an anterior or urogenital part, the sinus urogenitalis, and a posterior or rectal part. Up to the tenth week the sexes cannot be distinguished, but henceforth the peculiarities of each appear. The genital folds grow to be the labia majora;³ the edges of

¹ Although it would be gratifying to the æsthetic and moral sense to put this word in a particular relation to Hymen, the god of marriage, it simply means a membrane (*hūv*).

² Classic Latin, but in ancient times often comprising the whole genital canal.

³ Latin, *labium*, lip.

the genital furrow are developed as the labia minora; and the genital eminence becomes the clitoris,¹ round which is thrown a fold from the labia minora forming its prepuce.² The sinus urogenitalis remains in the shape of the vestibule. The posterior part of the genital folds

FIG. 34.

FIG. 35.

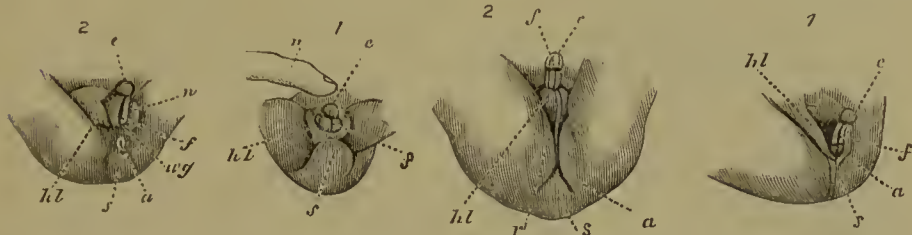


FIG. 34.—Formation of the External Genitals in Mankind. 1, lower portion of the trunk of an embryo from the eighth week, double size: *e*, gland or point of the genital eminence; *f*, genital furrow leading back to an aperture which at this period communicates with the rectum, and consequently is a cloacal opening; *hl*, genital folds; *s*, caudal extremity of the body; *n*, umbilical cord. 2, from a Female Embryo about 10 weeks old and 1 inch and 2 lines long: *a*, anus; *ug*, entrance to sinus urogenitalis; *n*, edges of genital furrow or labia minora. The other letters as in 1 (Kölliker).

FIG. 35.—1, from an Embryo 1 inch long, double size, representing a stage that precedes Fig. 34; 2, the sex is not yet distinguishable. 2, from a Male Embryo from the end of the third month, 2 inches and $1\frac{1}{4}$ lines long. Letters as in Fig. 34. In 2 the genital furrow is closed, forming the raphe (*r*) of the penis, scrotum, and perineum (Kölliker).

grow together, forming the perineum,³ which above unites with the partition which has divided the cloaca into two distinct cavities.

Literature Referred to.

BOEHM, C.: "Ueber Erkrankung der Gartner'schen Gänge" (*Arch. f. Gynäk.*, 1883, vol. xxi. p. 176).

BUDIN, P.: "Recherches sur l'Hymen et l'Ouverture du Vagin" (*Progrès médical*, 1879, Nos. 35, 36, 37, and 38).

CHAUVAU: *Anatomie comparée des Animaux domestiques*, 3d ed., Paris, 1879.

COURTY, A.: *Traité pratique des Maladies de l'Utérus et de ces Annexes*, Paris, 1866.

DOHRN, R.: "Ein Fall von Atresia vaginalis" (*Archiv für Gynäk.*, x. p. 544).

——: "Die Gartner'schen Kanäle beim Weibe" (*Arch. für Gynäk.*, 1883, vol. xxi. p. 328).

FISCHEL, W.: "Ueber das Vorkommen von Resten des Wolff'schen Ganges in der Vaginalportion" (*Arch. für Gynäk.*, 1884, vol. xxiv. p. 119).

FOULIS: "Cancer of the Ovary" (*Edinburgh Med. Journ.*, March, 1875).

GARTNER, H. T.: "Anatomisk Beskrivelse over et ved nogle Dyrearters Uterus undersøgt glandulöst Organ" (*Kongl. Dansk. Vidensk. Selsk. Skrifter*, Copenhagen, 1822).

GEIGEL, R.: *Ueber Variabilität in der Entwicklung der Geschlechtsorgane*, Würzburg, 1883.

HAGEMANN: "Ueber die Form der Höhlung des Uterus" (*Arch. für Gynäk.*, 1873, vol. v. p. 295).

HEDENIUS, P.: "Ett fall af uterus septus med en ensidig kongenital atresi" (*Upsala Läkareförenings Förhandlingar*, 1882, vol. xvii. p. 530).

¹ Classic Greek, κλειτορίς.

² Classic Greek, περίνεον or περίνειον.

³ Classic Latin, præputium.

- HIS, WILHELM: *Anatomie menschlicher Embryonen*, i.-iii., Leipzig, 1880-85.
- IMBERT, G.: *Developpement de l'Utérus et du Vagin*, Paris, 1883.
- JACOBSON, L.: *Die Okenschen Körper oder die Primordialnieren*, Kopenhagen, 1830.
- KOCKS, J.: "Die Gartnersehen Gänge beim Weibe" (*Archiv für Gynäkologie*, 1882, vol. xx. p. 485).
- KÖLLIKER, A.: *Entwicklungsgeschichte des Menschen und der höheren Thiere*, 2te Auflage, Leipzig, 1879.
- : *Ueber die Lage der weiblichen innern Geschlechtsorgane*, Bonn, 1882.
- : "Organe junger menschlicher Embryonen" (*Centralbl. für Gynäk.*, 1884, vol. viii. p. 585).
- MEYER, H.: "Ueber die Entwicklung der menschlichen Eierstöcke" (*Arch. für Gynäk.*, 1884, vol. xxiii. No. 2, p. 226).
- MILNE-EDWARDS, H.: *Leçons de Physiologie et d'Anatomie comparée*, vols. viii. and ix., Paris, 1870.
- PUECH, A.: *Des Ovaïres, de leurs Anomalies*, Paris, 1873.
- QUAIN: *Elements of Anatomy*, edited by Allen Thomson, E. A. Schäfer, and G. D. Thane, 9th ed., New York, 1882.
- RIEDER, CARL: "Ueber die Gartnersehen (Wolffsehen) Kanäle beim menschlichen Weibe" (*Virchow's Arch.*, vol. xvi. p. 100).
- SCHATZ, F.: Vier neue Fälle von unvollkommener Theilung des weiblichen Genitalkanals (*Arch. für Gynäk.*, 1870, vol. i. p. 12).
- SINÉTY, L. DE: *Manuel pratique de Gynécologie*, Paris, 1879.
- SKENE, A.: "The Anatomy and Pathology of Two Important Glands of the Female Urethra" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 265).
- WALDEYER, W.: *Eierstock und Ei*, Leipzig, 1870.
- WASSILIEFF, M.: "Betreffend die Rudimente der Wolffsehen Gänge beim Weibe" (*Arch. f. Gynäk.*, 1884, vol. xxii. p. 346).
- WINCKEL, T.: "Die Krankheiten der weiblichen Harnröhre und Blase," Stuttgart, 1877 (*Billroth's Handbuch der Frauenkr.*, vol. iii. part ix.).

THE ANATOMY OF THE FEMALE PELVIC ORGANS.

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NEW YORK.

INTRODUCTORY.—In venturing upon ground which has been so frequently trodden the writer would disclaim, at the outset, such an amount of original research as would entitle him to speak authoritatively upon any one of the many disputed questions which will arise in the course of the following studies. If, then, some mooted points are left undecided, it may be assumed, without further explanation, that the writer feels himself incompetent to settle them.

It is intended in this article to avoid such details as would be interesting only to the anatomist, and to present a brief and fairly accurate review of the pelvic organs as regarded from the standpoint of practical gynecology. The general reader, who has hitherto been content to limit his knowledge of pelvic anatomy to the half-dozen introductory pages in a textbook on obstetrics or diseases of women, will be surprised, on looking deeper into the subject, not so much at the unsolved problems that confront him on every side, as at the number of erroneous statements that have long received the sanction of the highest authorities.

In describing in detail the organs of generation there are several orders in which they may be considered. Thus they may be studied—1, in the order of their development; 2, according to their relative importance, or from within outward; 3, from without inward. The latter sequence, which is the one usually followed, is the most natural one, since we not only begin with the study of simpler structures and ascend gradually to those of greater complexity, but we observe the same order as in a systematic examination of the organs in the living subject.

It is customary to speak of the external and the internal genitals. The vagina is commonly included among the former, although not properly. It is better to describe it by itself as a connecting-link between the external, or visible, and the internal, or deep-seated, organs. The hymen is invariably described with the pudenda, when,

as will be shown later, it is strictly a part of the vagina, and should be considered with that canal.

THE EXTERNAL GENITALS.

SYNONYMS.—Vulva¹; *Lat.*, pudenda, cunus; *Fr.*, vulve, parties génitales externes; *Ger.*, Schamritze, Schamtheile; *It.*, vulva, pudende; *Sp.*, vulva, pudendum.

DEFINITION.—Under this term is included that portion of the genital tract which is visible externally.²

It should be added that this definition implies that the subject is placed in the recumbent posture, with the thighs abducted and the labia majora separated. In the nude erect female the mons Veneris alone is

FIG. 36.



The External Genitals, as seen in mesial section (Hentle): *a*, anus; *b*, perineal body; *c*, vagina; *d*, urethra; *e*, labium minus; *f*, clitoris; *g*, fossa navicularis, in front of which is the hymen.

visible (Fig. 36). The external genitals include the greater and lesser labia and the clitoris, with the parts immediately adjacent to them. The meatus urinarius belongs to the urinary tract, with which it will be described. Certain accessory structures, such as the bulbs of the vagina and the glands of Bartholin, may be regarded as common to both the vulva and vagina, while the pad of fat over the symphysis pubis, known as the mons Veneris, has no function whatever in connection with generation,³ but will be mentioned first on account of its architectural prominence.

¹ "Le vulve est l'ensemble des parties génitales externes de la femme;" so Quain's *Anatomy*, last ed.: "All the parts perceptible externally."

² The term "vulva" is not sufficiently exact, since it has been applied by some writers to the rima pudendi, by others to all the parts surrounding the entrance to the vagina and situated anterior to the hymen or caruncles. Etymologically, the vulva (valvula) includes the greater labia only; and this was its original meaning, according to ancient writers.

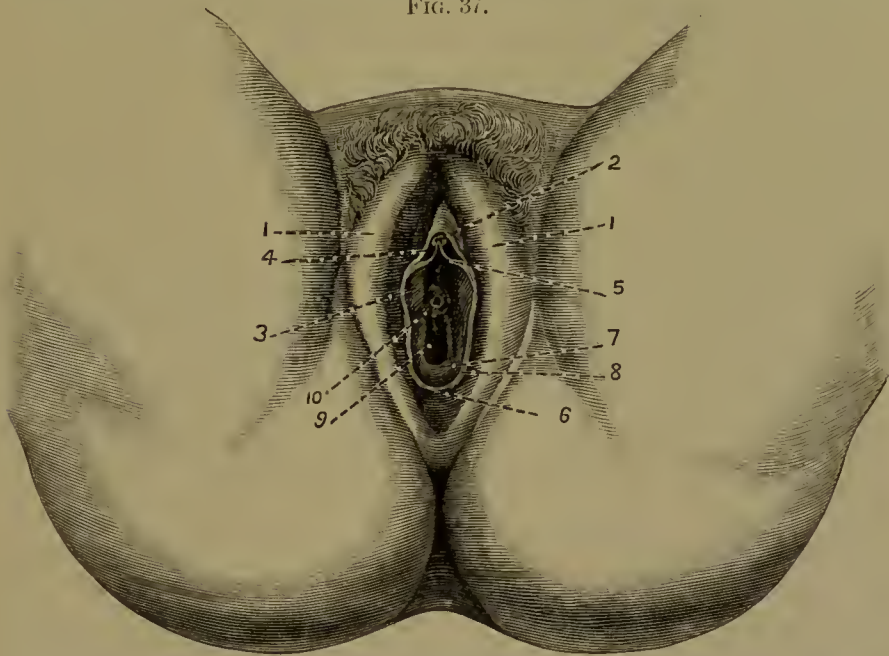
³ Comp. Tarnier, Charpentier, and Tillaux.

MONS VENERIS.

SYNONYMS.—“Mount of love;” *Fr.*, mont de Vénus, pénil, éminence sus-pubienne; *Ger.*, Schamlhügel; *It.*, monte di Venere; *Sp.*, monte de Venus.

DEFINITION.—The mons is a somewhat triangular area or projection

FIG. 37.



The External Organs of Generation (Luschka): 1, 1, labia majora; 2, glans clitoridis; 3, the nymphæ; 4, præputium clitoridis; 5, frænulum clitoridis; 6, frænulum nympharum; 7, hymen; 8, orifice of the glands of Duverney; 9, tuberculum vaginæ, 10, meatus urethræ.

situated in front of the symphysis pubis. It is covered with a thick growth of coarse hair.

The triangular area mentioned is continuous at its apex with the upper extremities of the labia majora, while its base is defined by a groove at the lower limit of the hypogastrium, which is more or less sharply defined according to the amount of adipose tissue in the abdominal wall. Laterally, the elevation melts away gradually toward the inguinal folds, which form its extreme lateral boundaries. The mons cannot be regarded as in any sense an independent structure, since it is merely an imperfectly circumscribed collection of fat, supported by connective tissue, varying in prominence in different subjects. The integument over this region is thicker than that covering the rest of the abdomen, while the hair is coarser and more crisp than that found elsewhere in the body, and has a decided tendency to curl. Its color will be found to correspond quite closely with that which is natural to the peculiar type of individual in which it is observed, but it is

frequently several shades darker than the hair of the head, especially in brunettes. Appearing at puberty, this hair reaches a certain stage of development, at which it persists through life. It is rather late in undergoing the senile change. It may be stated as a curious, rather than an important, fact that the upper limit of the hairy growth on the external genitals of the female is rather sharply defined by the groove before mentioned. It is rare to find a line of hair following the course of the linea alba as high as the umbilicus, a distribution commonly observed in the male. Among five or six hundred women in the lying-in wards of the Vienna General Hospital, whose abdomens the writer inspected with the view of collecting data bearing on this point, not over half a dozen presented the hirsute development described, and these were subjects of a decidedly masculine type.

ANATOMY.—A. *Gross*.—This projection, as before stated, is essentially a cushion of adipose tissue traversed by interlacing fibrous and elastic bands, and covered by the skin and superficial fasciæ which are common to the abdominal wall. The skin is thick and has an oily feel, the latter peculiarity being due to the presence in it of numerous sebaceous glands. On removing the integument a delicate layer of fascia is seen, which is continuous with the superficial fasciæ of both the abdomen and thighs. This layer is separated with difficulty, since it is traversed by elastic fibres which come from the subjacent tissue, where they form a close network. Certain bundles of these fibres have a definite direction, and have been differentiated by Broca in his description of the *sac dartoïque* (“pudendal sac” of Savage¹). Thus, some extend laterally as far as the borders of the external inguinal rings; another set enter the suspensory ligament of the clitoris, and others blend with the elastic tissue of the labia majora. The terminal fibrils of the round ligaments may be traced by careful dissection into the midst of the fibro-lipomatous tissue of the mons. As will be inferred from the above description, the fat composing the mons is arranged in the form of lobules, separated by fibrous trabeculæ, and it does not appear as a diffuse mass.

B. *Minute*.—The microscopic anatomy of the suprapubic region may be dismissed in a few words, since it is identical with that of any other portion of the skin, plus an extra amount of adipose. Hair-bulbs, sebaceous, and sweat-glands will be seen in a cross-section; the existence of the latter structures has been questioned, though without sufficient reason.

LABIA MAJORA.

SYNONYMS.—Greater, or external labia, lips of the vulva; *Lat.*, labia externa, seu eunni, sen pudendi, alæ majores, etc.; *Fr.*, grandes lèvres,

¹ *Anatomy of Female Pelvic Organs.*

lèvres de la vulve ; *Ger.*, grosse Schamlippen ; *It.*, grandi labbra ; *Sp.*, labios mayores.

DEFINITION.—The labia majora are two cutaneous folds which begin at the lower part of the mons Veneris, extend downward and backward on either side of the vulvar cleft, and terminate by blending with the integument of the perineum. Luschka¹ has shown that there is no well-marked line of separation between the opposite labia, and hence that the expressions “anterior” and “posterior” commissures, so far as they convey the idea of connecting bands, are incorrect.² By the anterior commissure we understand simply a median projection situated from one to one and a half centimeters above the clitoris; it represents the point of fusion of the labia with the mons Veneris, and forms the anterior or upper extremity of the rima. The posterior commissure is still less distinct, and only appears as a band when the labia are widely separated. It is a *region*, rather than a well-defined *bridge of skin*; it is not possible to identify the exact point at which either labium ends and the perineum begins. The prevailing inaccuracy in the description of the posterior commissure has led to a similar looseness of expression with regard to the antero-posterior extent of the perineum, which is commonly represented as stretching from the anus to the posterior commissure, instead of to the lower edge of the vulvar orifice.³

Gross Appearance.—The cross-section of a labium is somewhat triangular in shape, so that we may regard each labium as possessing three sides—a base, which rests upon (but is not attached to) the ramus of the pubes, and two surfaces, an external and an internal. The external surface is convex, rugose, and bears a resemblance to the scrotum, of which it is considered the analogue. The integument is similar to that covering the mons, and has a growth of hair continuous with that of the pubic eminence, while its sebaceous glands are so large that their openings are visible to the naked eye. This surface is limited externally by the genito-crural fold.

The inner surfaces of well-rounded labia, especially in the virgin, are always in contact, except when the thighs are strongly abducted. They are normally smooth, soft, and of a reddish color, offering a decided contrast to the outer surfaces. Scattered hairs of a fine, downy character are apparent on close inspection.

The labia are subject to variations both in size and in degree of approximation. In young, well-developed subjects they are firm, plump, and are so closely in contact as to entirely conceal the parts

¹ *Anatomie des menschlichen Beckens*, p. 407.

² Equally questionable is the statement of Hart and Barbour, that “they form by their junction—the anterior commissure—the structure known as the mons Veneris” (*Gynecology*, p. 46).

³ Comp. Savage's definition of the perineal body, *Female Pelvic Organs*, pl. i., text.

behind them (vulva connivens). With the disappearance of their adipose tissue, a change which occurs normally in old age, they become flabby and pendulous and no longer cover the nymphæ. The appearance presented by such gaping labia, as observed with the subject in the dorsal position, was designated by the older anatomists as the vulva hians. It should be added that the vulvar cleft is equally exposed in the fœtus, but the condition here is to be ascribed to the incomplete development of the greater labia.

ANATOMY.—A. *Gross*.—The structure of the labia is similar to that of the mons, so far as regards their integument, adipose, and elastic tissue; but the latter assumes more importance here, and deserves our careful consideration. A layer of fat, of variable thickness, lies just beneath the skin. It is most abundant near the mons and toward the external surface, but fades away toward the posterior commissure and internal surface. The elastic fibres may be divided into superficial and deep bundles, the former appearing as a thin stratum continuous with the deep layer of the superficial perineal fascia. Sappey describes in it smooth muscular fibres, and compares it to the dartos. The deeper bundles of elastic tissue were originally described by Broca, who distinguished four main groups, one of which, he says, comes from the mons, and others from the borders of the external ring and from the pubic rami. The disposition of the elastic tissue of each labium in the form of a sac, having its neck at the external ring and its fundus just above the posterior commissure, was described by the same author. This structure, which practically includes the entire labium except the integument, is, as Savage admits, rarely defined save in cases of labial hernia. It is really formed by the superficial layer of elastic tissue (that continuous with the perineal fascia) which is attached around the margin of the ring. Within the sac are the deeper fibres, forming a network in the midst of a quantity of adipose tissue, as in the mons. If this is followed up to its junction with the mons, the lower terminal fibres of the round ligament will be found. In the neck of the sac will occasionally be seen the persistent process of peritoneum known as the canal of Nuck. The labia derive their arterial supply from the superficial perineal branch of the internal pudic. The veins form rich plexuses in the subcutaneous tissue, finally communicating with the vaginal bulbs, and accompany the arteries: the lymphatics enter the superficial inguinal glands, following the course of the external pudic artery, as do those of the scrotum. The nerves are the superficial perineal branches of the internal pudic and the inferior branch of the small sciatic.

B. *Minute*.—The skin of the labia is distinguished by the unusual size of its hair-bulbs and sebaceous glands. Sweat-glands are also present. The hair-follicles gradually disappear toward the inner sur-

face, but the glands persist. For a description of the papillæ, the distribution of the blood-vessels, and the ultimate terminations of the nerves the reader is referred to the chapter on the skin in any work on normal histology. There is nothing peculiar in the minute anatomy of the fibrous and adipose tissue.

It is difficult to conceive how any writer can affirm of the labia that "the inner surface is in all respects like a mucous membrane, except that it possesses sebaceous glands in place of mucous follicles."¹

LABIA MINORA.

SYNONYMS.—Lesser labia, nymphæ; *Lat.*, labia pendendi minora, seu interna, alæ minores; *Fr.*, petites lèvres, nymphes; *Ger.*, kleine Schamlippen; *It.*, piccole labbra; *Sp.*, pequeños labios.

DEFINITION.—The labia minora are two muco-cutaneous folds or flaps which are situated between the labia majora, from the inner surfaces of which they appear to spring. The nymphæ are ordinarily described as "two reddish folds of mucous membrane."² Hart asserts, confidently, that "they are skin, thin and fine, and not mucous membrane, as often alleged."³ The writer is not prepared to accept this latter statement without qualification, at least with regard to the labia minora in the virgin, which are always covered by the external parts. Their outer surfaces may indeed be regarded as true skin, but the internal approach so closely to the character of mucous membrane that the difference between the two is inappreciable. It is only when the nymphæ have been long exposed by the separation of the labia majora that their inner surfaces assume the appearance of integument. The writer suggests the adjective "muco-cutaneous" as a compromise. The subject will become more intelligible after the reader has studied the minute structure of the tissues.

Gross Appearance.—These folds are usually symmetrical, although one is sometimes a little larger than the other. They are of a rose-red hue in the virgin, but may become of a dark-blue or slaty color during pregnancy or after they have been long exposed. Their general appearance has been aptly compared to that of a cock's comb. Beginning just below the anterior commissure, the nymphæ appear as double folds which meet above and below the clitoris, forming respectively the prepuce and frænnulum of the clitoris; they then descend on each side of the vestibule, along the base of the inner surface of the labium, with which they apparently blend at about its middle. They are not lost

¹ Lusk, *Science and Art of Midwifery*, 1st ed. p. 3—corrected in last edition.

² *Op. cit.*, p. 4; Ranney, *Topographical Relations of Female Pelvic Organs*, p. 67.

³ Hart and Barbour, *Gynecology*, p. 6; also, Hart, in *Edinburgh Med. Journal* for Sept., 1882.

here, however, but reappear at the lower extremity of the vulva, where they are united by a thin muco-entaneous commissure known as the fourchette, or *frænum vulvæ*;¹ in fact, they are sometimes prolonged so as to encircle the entire orifice. These folds are entirely concealed in the virgin, being only exposed when the external labia are widely separated. They are quite prominent in the foetus, because of their relatively advanced development, and in the aged by reason of the gaping vulva.

Fourchette.—This is a delicate fold of skin (or skin and mucous membrane?) which unites the posterior extremities of the nymphæ. It is situated in front of the posterior commissure, being distant from the anus 2.7 cm. in nulliparæ, and 2.5 cm. in women who have borne children.² Its persistency in the latter is by no means so uncommon as most writers affirm. The fourchette occupies a different position according as the nymphæ are in contact or are artificially separated. Under the former conditions it is but faintly marked as a loose fold between the hymen and the posterior commissure; but when the nymphæ are drawn apart it appears as a tense band, separated from the posterior border of the ostium vaginae (or, more properly, from the lower portion of the hymen) by a depression which, from a fancied resemblance, has been termed the fossa navicularis. It should be clearly understood that this fossa is *not* a natural depression, but is produced artificially when the fourchette is put on the stretch by lateral traction.³ The subject being supine, it is bounded in front by the inner surface of the fourchette, behind by the anterior surface of the hymen, while its base rests upon the perineal body.

The writer has frequently identified the line mentioned by Hart and Barbour, which, according to these writers, forms as sharp a limit between skin and mucous membrane as the well-known "white line" at the anal orifice. This line of separation is described as running along the bases of the internal aspects of the nymphæ, and crossing between the two below the prepuce of the clitoris in front and at the base of the outer aspect of the hymen posteriorly.

ANATOMY.—A. *Gross.*—Without attempting to discuss this disputed subject at length, we shall assume that the labia minora consist essentially of delicate skin, which on their inner surfaces passes over insensibly into a sort of transitional tissue, the character of which differs

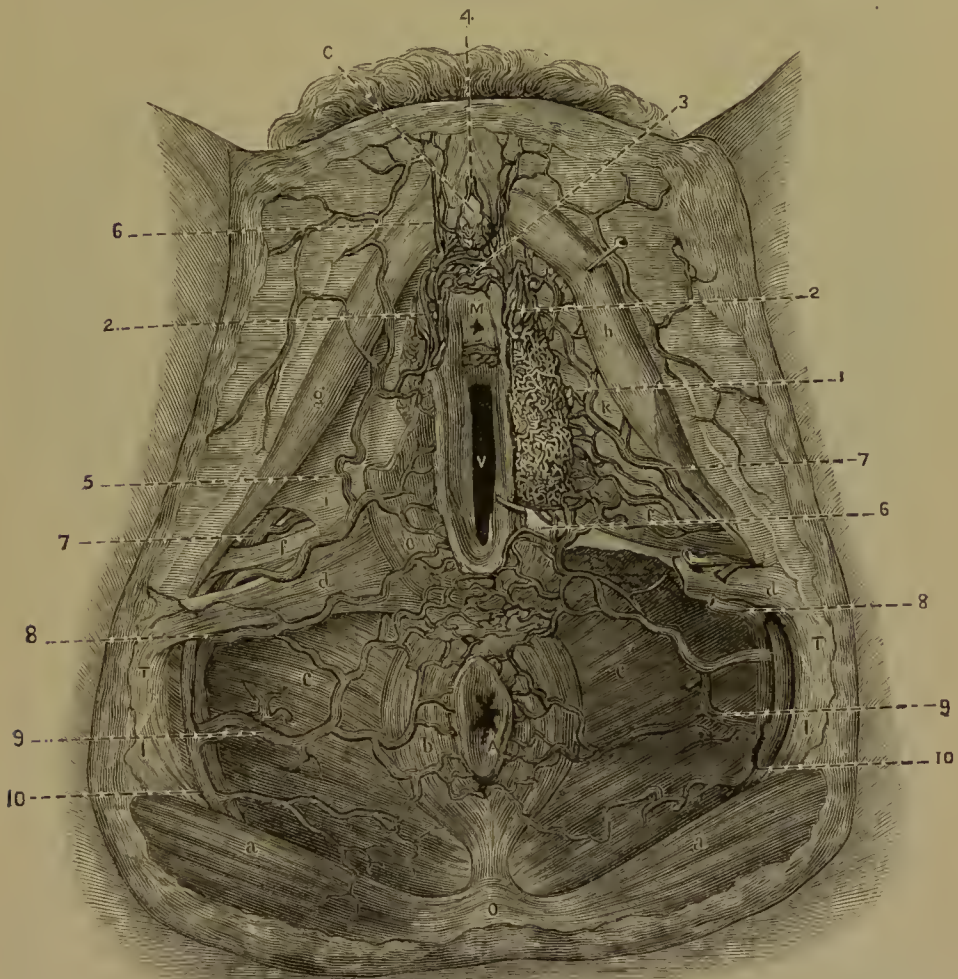
¹ Luschka was the first who called attention to the fact that the fourchette unites the lesser, and not the greater, labia (*op. cit.*, p. 403). Hart and Barbour are, strangely enough, at variance with him (*op. cit.*, p. 6).

² Foster, "Topographical Anatomy of the Uterus and its Surroundings," *Am. Journ. Obstet.*, vol. xiii., Jan., 1880.

³ Ranney is correct in his criticism of the statement made by Hart and Barbour, that "when the fourchette is *pulled down* by the finger a boat-shaped cavity is made—the fossa navicularis" (*op. cit.*, p. 66).

in different subjects. While it may sometimes be regarded as true skin, the limit of which is defined by the line before described, it can, on the other hand, rarely be considered as true mucous membrane, such as that which lines the genital canals. The writer believes that it will even-

FIG. 33.



The Superficial Veins of the Perineum (Savage): *h, g*, crura clitoridis; *C*, corpus clitoridis; 1, 2, 3, corpus cavernosum urethrae; 5, superior perineal and obturator veins; 6, veins of communication with superficial epigastric veins; 8, 9, 10, pudic vein and primary branches; *M*, urethral meatus; *V*, vaginal aperture; *A*, anus; *T*, tuberosity of ischium; *O*, coccyx; *G*, vulvo-vaginal gland; *a*, anterior border of gluteus maximus muscle; *b*, superficial sphincter ani muscle; *c, c*, pubo- and obturator coccygeus muscle, closing upward the posterior perineal space bounded by the coccyx; *O*, lower border of gluteus; *a*, larger sciatic ligament; *L*, tuberosity of the ischium; *T*, superficial muscles, *d, d*; and inferior border of perineal septum; *f, c*, bulbo-cavernosus muscle; *i*, anterior aponeurosis, and *k*, posterior aponeurosis, of perineal septum; *g*, erector clitoridis muscle; *h*, left crus clitoridis.

tually be shown that the Edinburgh anatomist is correct in his statement, but as yet the evidence is not wholly conclusive. We are at

least justified in affirming that the nymphæ are *not* "folds of mucous membrane."¹

The subcutaneous tissue of the nymphæ is entirely devoid of that fat which forms such a prominent part of the labia majora. It consists almost entirely of a fibro-elastic framework supporting a rich venous plexus, in the meshes of which are bundles of smooth muscular fibres. It is questionable if we are justified in regarding this, with Gassenbaur, as a variety of cavernous tissue. Kobelt² excludes the nymphæ from the class of erectile structures.

The arterial supply of the lesser is derived from the same source as that of the greater labia (internal pudic). The large venous plexuses not only empty into affluent vessels which enter the pudic vein, but communicate freely with the vaginal bulbs and with the perineal veins,³ thus forming a link between the pelvic and perineal systems. The nerves and lymphatics are common to both the labia majora and minora.

B. Minute.—A cross-section of one of the nymphæ presents the following appearances: The free surface is covered with several layers of stratified epithelium, the lowermost cells containing pigment-granules. Beneath the epithelium is the connective-tissue basis, which consists of interlacing fibres, some of which are elastic. Bundles of smooth muscular fibres will be recognized by their large fusiform cells; the latter will be found in greatest numbers along the course of the vessels. The fibrous tissue forms numerous papillæ, which project into the epithelial layer and are provided with vascular loops, the veinlets returning from which enter the plexuses before alluded to. A superficial capillary network immediately below the epithelium has also been described. The peculiar nerve-termination described by Krause as "end-bulbs" are also seen in the papillæ. One striking feature in the minute anatomy of the nymphæ is the presence in them of large sebaceous glands, which open upon the free surface. According to some authorities, these are confined to the outer aspect of the labium;⁴ they are said to be absent at birth. It is generally agreed that hairs are entirely absent from the labia minora: this is rather a curious fact when taken

¹ There is no profit in pursuing this discussion farther here, since it resolves itself merely into an expression of personal opinion. Most authorities in histology, it must be admitted, describe the labia minora (when they describe them at all) as genuine mucous folds. Klein characterizes them somewhat vaguely as "fibrous connective-tissue mucous membrane" (*Elements of Histology*, p. 270).

² *Die Männlichen u. Weiblichen Wollust-Organ des Menschen.*

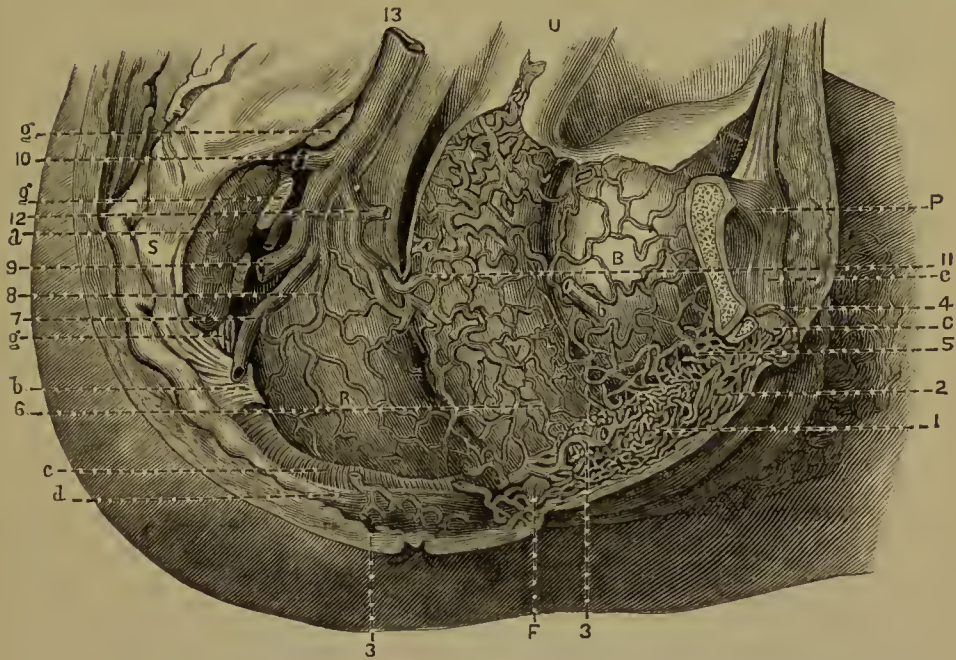
³ No description can convey any idea of the vascular richness of these parts which can compare with Savage's plates (pls. vi., vii.). The reader must bear in mind that it is only in very successful special injections that the venous plexuses can be traced continuously.

⁴ Satterthwaite, *Manual of Histology*, chap. xvi.

in connection with the presence of the glands, since the two are usually inseparable.¹ The latter furnish a strong argument in favor of the tegumentary character of the labia.

As to the venous plexuses, it may be added that, in spite of their free communication and the elastic tissue in which they run, we can

FIG. 39.



The Venous Plexuses of the Vagina and Vulva, as seen in mesial section (Savage): *B*, bladder, partially inflated; *b*, ureter; *V*, vagina; *P*, section of pubis; *R*, rectum; *C*, clitoris; 1, bulb; 2, its urethral venous process; 3, lower efferent veins; 4, dorsal vein of the clitoris; 5, urethral venous plexus; 6, commencement of vaginal venous plexus; 7, 8, 9, 10, sciatic and gluteal veins; 11, uterine veins; 12, obturator vein; 13, internal iliac vein; *a*, pyriformis muscle; *b*, larger sciatic ligament; *c*, pubo- and obturator- and ischio-coxal muscles; *d*, suspensory ligament of the clitoris; *F*, bulbo-vaginal gland; *g, g, g, g*, roots of sacral plexus of nerves.

hardly regard them as sufficiently large and intimately connected with the terminal arteries to justify the application of the term "erectile" to this tissue.²

The minute anatomy of the fourchette is similar to that of the nymphæ. Ranney³ states confidently that its inner surface, "since it possesses minute hairs, is considered as properly belonging to integumentary structures:" the latter clause may be true, although the former is questionable.

¹ Quain's *Anatomy*, 9th ed., vol. ii. p. 256.

² Compare the definition of "erectile tissue" in Quain's *Anatomy*, 8th ed., vol. ii. p. 180.

³ *Top. Relations of Female Pelv. Organs*, p. 65.

CLITORIS.

SYNONYMS.—*Gr.*, *Κλειτορις*; *Lat.*, penis muliebris, membrum muliebre; *Fr.*, clitoris; *Ger.*, Kitzler; *It.*, clitoride; *Sp.*, clitoris.

DEFINITION.—A small, curved, oblong organ, the analogue of the penis in the male, situated at the apex of the vestibule just below the anterior commissure.

As ordinarily seen, the clitoris (or rather its glans) appears as a small pea-shaped projection hidden between the diverging folds of the labia minora. It is only when the latter are widely separated that the end of the organ is seen. The reader whose attention has not been specially directed to the subject will be somewhat surprised at the actual size of the clitoris in the living female, since many of the descriptions and drawings in the textbooks must have led him to suppose that it actually resembles a small penis. Nothing could be more erroneous than this notion. The glans clitoridis, which is the only portion of the organ that we ever see normally, except in dissections, is in its most turgid condition merely a small projection, rarely larger than a small pea, and more often smaller. In some women it cannot even be discovered without a search. By bearing this fact in

mind the relative insignificance of the clitoris when compared with the male organ will be intelligently appreciated. Of course, the apparent variations in the size and prominence of the former are explained to some extent by the thickness of the nymphæ. Although it has but a limited range of motion, during erection it becomes distinctly arched, the glans protrudes sensibly, while the body may be felt as a firm cord curving upward and backward until it is lost beneath the pubic arch.



The Venous Plexuses of the Clitoris (Savage): 1, nervous expansion on the blunt end of the clitoris; 2, dorsal vein of clitoris; 3, urethral venous process of bulb; 4, pubic communicating branches; 5, pars intermedia; 6, upper part of bulb; 7, suspensory ligament of clitoris; 9, section of right crus clitoridis.

Gross Appearance.—The component parts of the clitoris, as considered from before backward, are the glans, body, and crura. The attached folds of the nymphæ, known as the prepuce and frænulum, should properly be described in connection with the glans.

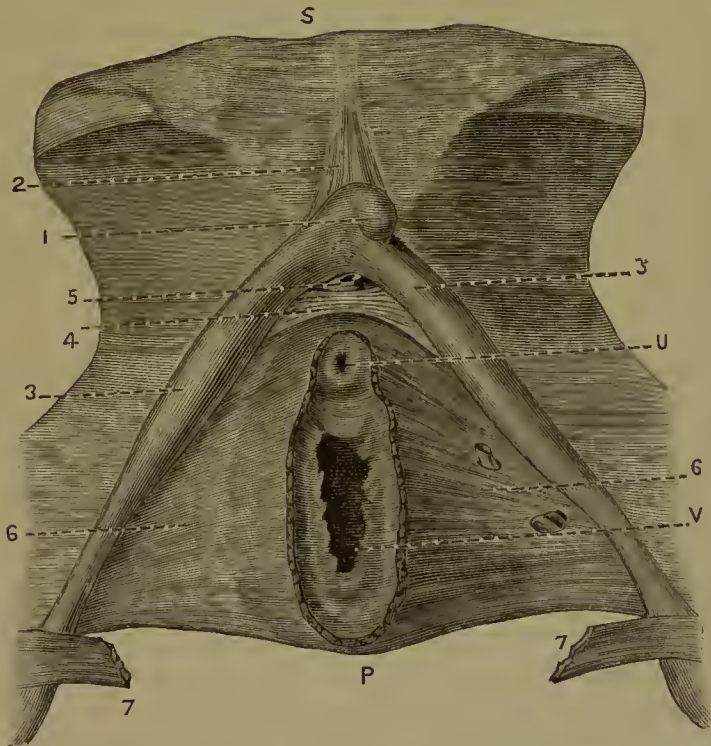
The glans clitoridis, which is the only portion of the organ visible without dissection, is a small mass of erectile tissue covered by mucous membrane (or skin?), which is partially enveloped by a sort of hood formed by the upper of the two folds into which the nymphæ divide (preputium clitoridis). The lower folds bend sharply inward to meet in the median line beneath the glans, to which they are attached, forming its frænulum¹ (Fig. 40).

¹ Hart and Barbour describe the frænulum as if it was the same as the suspensory

If the reader will remember the difference of opinion concerning the true character of the tissue covering the nymphæ, he will rightly infer that the same doubt exists as to whether the glans, with its frænulum and prepuce, is clothed with skin or with mucous membrane.¹

The corpus elitoridis is a firm, cord-like body, seldom exceeding an inch² in length even when turgescient. It is situated in the median line in front of and below the symphysis pubis, and may be traced upward beneath the prepuce, and then backward to a point immediately under the anterior edge of the pubic arch, where it divides into the two crura (Fig. 41.) It is partly attached and partly dependent, the limit

FIG. 41.



Front View of Perineal Septum, showing entire clitoris (Savage): 1, clitoris; 2, suspensory ligament; 3, crura of clitoris; 4, subpubic ligament; 5, dorsal vein of clitoris; 6, perineal septum; 7, superficial transverse muscle; U, urethra; V, rectum and vagina; P, site of perineal body.

between the fixed and movable portions being defined by the point of insertion of the suspensory ligament. The latter is a small, but perfectly distinct, band of fibres which extends from the anterior aspect of

ligament of the elitoris (*Gynecology*, p. 4). Ranney says that the lower folds of the nymphæ "help to complete the suspensory ligament of the clitoris" (*op. cit.*, p. 67). This is certainly an error. In Quain's *Anatomy* (9th. ed., p. 700) we read: "There is a small suspensory ligament attached to the upper border, like that of the penis." This agrees with Savage's plate (pl. vi. Fig. 3) and with the writer's own dissections.

¹ Lusk (p. 3) speaks of the "cuticular covering of the glans"—an apparent inconsistency, as he considers the prepuce as a mucous fold.

² Quain says an inch and a half.

the symphysis (above its middle point) to the upper border of the posterior half of the corpus clitoridis. In front of its point of attachment the clitoris is somewhat dependent, like the penis, although its movements are further restrained by the frænulum.

The crura are two long, fusiform processes of spongy tissue, less than half an inch in diameter, which arise from the anterior borders and inner surfaces of the pubic and ischiatic rami, to which they are attached by firm connective tissue: they extend upward along the anterior edges of the ascending rami until they almost reach the symphysis, when they turn forward and coalesce beneath the arch to form the body. The inner side of each crus is covered by the slender erector clitoridis muscle (erector penis or ischio-cavernosus), which has its origin on the front of the tuber ischii, and its insertion by two separate tendinous expansions, "one above, where the crura join to form the clitoris—one in front and somewhat below."¹

ANATOMY.—A. *Gross*.—The clitoris consists essentially of cavernous tissue surrounded by a firm, fibrous covering (tunica albuginea), over which is an extremely sensitive tissue. Its gross resemblance to the penis, which is only partially apparent in the glans, is borne out in a longitudinal section of the body, which shows that it is composed of symmetrical halves (corpora cavernosa) separated by an imperfect or rudimentary septum pectiniforme. These corpora cavernosa are clearly the prolongations of the crura, which they resemble both in their gross and in their microscopic anatomy.

The spongy character of the tissue is apparent even to the naked eye: the trabeculæ look much finer than those of the male organ. The crura resemble unyielding fibrous cords, so that the presence in them of erectile tissue would never be suspected from an external examination. On section this tissue is found to occupy the central portion of each crus, and to disappear gradually toward the point of origin. It is covered by a thick fibrous layer of almost cartilaginous firmness, which gives to the body its cord-like feel.

At their origin the crura are entirely fibrous (or ligamentous?) in their structure (Fig. 41).

Vascular Supply.—In studying this we enter upon the subject of the erectile organs of the female,² which should first be considered in detail, and then in their relations to one another and to the general circulation. The clitoris is the most important link in the chain that may be said to

¹ Savage, *op.cit.*, p. 6 and pl. i.

² Ranney (*op. cit.*, p. 98), after Savage, divides the pelvic structures rather arbitrarily into three classes—the "erectile," "erecto-turgescens," and "turgescens." The former includes the clitoris and its crura; the latter the urethra and vagina; while the body of the uterus and the ovarian and vaginal bulbs belong to the second class. As this idea rests upon physiological rather than upon anatomical facts, we can give only this passing reference to it.

begin at the vaginal bulbs and to end at the ovary. It receives its arterial supply from the two terminal branches of the pudic, which run between the point of junction of the crura and the arch of the pubic bones, pierce the suspensory ligament, and follow along the dorsum of the organ on either side of the vein. One of these vessels supplies the body of the clitoris, corresponding to the artery of the corpus cavernosum in the male; it is called the profunda. The other, larger branch is the analogue of the dorsal artery of the penis, and divides at its termination into twigs which supply the glans and prepuce (dorsal artery).¹ These two arteries have a free intercommunication by means of their small branches. Their peculiar ultimate terminations will be described with the minute anatomy of the part. The blood is returned from the clitoris by the dorsal vein, which begins by the union of efferent branches from the glans, around the end of which is a small plexus, and receives numerous tributaries as it passes backward along the dorsum between the two arteries before mentioned, and reaches the pelvis by ascending to the space between the arch and the subpubic ligament. It terminates in the vesical plexus.² The upper ends of the vaginal bulbs are so intimately related to the veins of the clitoris that Hart and Barbour regard the pars intermedia as almost a portion of the organ. "The glans clitoridis," they affirm (p. 4), "is not directly continuous with the body, but joins it *through the pars intermedia of the bulb.*" The writer has never been able to verify this statement.³ Besides their connection with the pars intermedia, the veins of the clitoris communicate with the urethral, perineal, pelvic, and, indirectly, with the obturator veins, as will be readily understood by a glance at Savage's plates (pl. vi.). The difference between the vascular supply of the penis and clitoris is greater than appears at first sight, that of the latter being both richer and more complex in its relations. The difference may be roughly stated by saying that the penis has a richer *internal*, the clitoris a more extensive *external*, supply.

The clitoris is surrounded by a plexus of lymphatics which receive numerous branches from the deep tissues, the whole terminating in the superficial inguinal glands.

The nerves of the clitoris are unusually numerous, considering its size. "Small as this organ is compared with the penis," says Savage, "it has in proportion four or five times the nervous supply of the latter." Numbers of fibres belonging to the sympathetic system accom-

¹ Kobelt (*op. cit.*) mentions several small unnamed branches which run to the corpora cavernosa.

² For an elaborate description of the venous plexuses of this region see Gussenbauer's paper, "Ueber das Gefäss-System der äusseren Weiblichen Genitalien," *Sitzungsber. der Wiss.*, July, 1869.

³ Savage refers to the pars intermedia as "a double row of veins issuing from a double series of apertures at the under surface of the clitoris."

pany the arteries and enter with them the erectile tissue. The pudic nerve, after giving off muscular branches, terminates in a twig of much larger relative size than the corresponding one in the penis, which accompanies the artery between the layers of the deep perineal fascia, pierces the suspensory ligament, and runs along the dorsum as far as the glans, where it terminates in a network which has been aptly described as "a true nervous sheath." It gives off several branches to the body and prepuce, and one of considerable size to the interior of the organ. There is a free communication between the sympathetic and spinal nerves of the clitoris.

B. *Minute*.—The minute structure of the organ resembles so closely that of the penis that it will be unnecessary to repeat a description with which the reader is doubtless somewhat familiar. The glans has an external covering which is similar to that of the nymphæ as regards the presence of papillæ, covered by layers of stratified epithelium and containing capillary loops and nerve-terminations (end-bulbs). There are present in addition a special variety of end-bulbs known as "the genital corpuseles of Krause," which are also found in the mucous covering of the glans penis. The erectile tissue of both the glans and body does not need a separate description. As before stated, the trabeculæ are more delicate than in the penis, and the tissue is rather a collection of venous plexuses than of cavernous spaces. The opposite halves of the corpus are practically one, since the septum between them offers no barrier to the free intercommunication of the plexuses. If a number of cross-sections of the corpus and crura are examined, the fibrous covering (tunica albuginea) will be seen to increase in thickness from before backward at the expense of the spongy tissue, until the latter dwindles away at the origin of the crura.

VESTIBULE.¹

SYNONYMS.—*Lat.*, vestibulum, atrium vaginæ; *Fr.*, vestibule, canal vulvaire; *Ger.*, Vorhof; *It.* and *Sp.*, vestibulo.

DEFINITION.—The vestibule is a triangular area, the sides of which are formed by the inner edges of the nymphæ, while its base corresponds with the upper margin of the vaginal orifice. Its apex lies immediately below the clitoris.

The vestibule is ordinarily included among the structures forming the vulva, although it is simply a surface covered by mucous membrane, which is of importance only because of the structures contained

¹ As its name implies, the vestibule has been regarded as the entrance to the vagina. Thus Dunglison defines it as "a smooth cavity between the perineum and nymphæ in the female, which leads to two passages—to the urethra above and to the vagina below." French anatomists have termed it the canal vulvaire. It is better to regard it as entirely independent of the vaginal orifice.

within it. Heule applies the name to the labia pudendi and the space between them.

Gross Appearance.—The vestibule is covered by mucous membrane, which presents a corrugated appearance. The color of this membrane is redder and its texture finer than that of the nymphæ. The line of separation between skin (or transitional tissue?) and mucous membrane is not so well defined here as it is at the edge of the vaginal orifice. Several depressions or crypts (*glandulæ vestibulares minores*) will be observed on the floor of the vestibule: most of these are ranged about the urethral opening, which appears as a small dimple or pucker in the mucous membrane at the middle of the base of the triangle, three-fourths of an inch below the clitoris and about an inch from the fourchette. The meatus will be described with the urinary tract.

The dimensions of the vestibule, as well as the appearance of its mucous membrane, are quite variable, especially in multiparæ. Moreover, the crypts are sometimes of minute size, while they may be one-third as large as the meatus. They vary in number; there are generally five or six.

ANATOMY.—A. *Gross.*—On dissecting off the mucous membrane of the vestibule an intricate venous plexus will be observed, which can only be studied satisfactorily by means of special injections. When fully injected these veins are seen to have a general transverse direction both above and below the urethral orifice; they constitute the *pars intermedia*, and serve both to unite the opposite vestibular bulbs (hence the name “isthmus”) and to establish a free communication between these bodies and the vessels of the corpora cavernosa of the clitoris.

Much confusion has arisen on account of the vague description of the bulbs in most textbooks. A study of the best plates, supplemented by careful dissections of this region, will convince the reader that the bulbs are situated not within, but at the sides of, the vestibular area, that space being occupied only by the connecting plexuses above mentioned. Moreover, the expression “*glandulæ vestibulares majores*,” as applied to the vulvo-vaginal glands, is misleading, since it gives the impression that these structures are related to the vestibule, which is incorrect.

B. *Minute.*—Microscopically, the vestibule presents nothing of special interest: as viewed in a cross-section its superficial covering consists of several layers of pavement epithelium. The mucous glands, the diameters of which vary from 0.5 to 2.5 mm., are of the compound racemose type, consisting of numerous acini which open into branching ducts; these latter terminate in single short ducts which open on the free surface by large orifices. The acini are lined with a single layer of columnar epithelium, which is continued into the ducts as far as their orifices,

where it passes gradually into the pavement variety. Beneath the mucous membrane is a rich network of fine capillaries, which may be traced into papillæ to form loops, in the manner already mentioned. Sebaceous glands are entirely absent. There are no special features about the nerve-supply of this region; it is not so rich as that of the surrounding parts. Beneath the mucous layer is a layer of connective tissue in which is the venous plexus constituting the *pars intermedia*. The veins are immediately surrounded by a layer of fibro-muscular tissue, so that this region may be included among the turgescient bodies in Savage's classification.

Before describing the vagina it is necessary to refer to two pairs of bodies which are in immediate relation with the vulvo-vaginal orifice, although, as has been stated, they are more commonly described in connection with the vestibule. These are the vaginal bulbs and the vulvo-vaginal glands. These structures are quite dissimilar in their character and functions, since the former are essentially erectile masses belonging to the chain which terminates with the bulbs of the ovaries, while the latter are simply mucous glands of unusual size.

The bulbs of the vagina (*bulbi vestibuli vaginæ*, bulbs of the vestibule) are two oval masses of veins situated on either side of the base of the vestibule and the upper two-thirds of the vulvo-vaginal outlet. They have been described as "leech-shaped masses of reticulated veins." They are somewhat conical in shape, their bases, which are rounded and measure half an inch in diameter, being opposite the lower third of the ostium, while their apices (not sharply defined) extend as high as the level of the meatus urinarius, where they are prolonged by the *pars intermedia* as high as the root of the clitoris.¹ Their length is about an inch and a half. It should be stated, in explanation, that this description of the bulbs applies to these bodies when distended by injection. The reader who attempts to dissect them out in their collapsed state will be greatly disappointed at the discrepancy that will exist between his dissections and the classical plate of Kobelt.² Hence Hart and Barbour (p. 10) describe them as "small masses of erectile tissue about the size of a *bean*." When distended they fill the spaces between the vestibule and edges of the ostium and the pubic arch. Their relations have already been partly described. They surround the ostium vaginæ, their inner surfaces being just beneath the mucous membrane of the vagina, while posteriorly they are in contact with the anterior layer of the triangular ligament. They

¹ Quain (*Anatomy*, last ed.) makes the doubtful statement that "their upper pointed extremities are attached to the crura of the clitoris."

² It is difficult to escape the impression that Kobelt's drawing is exaggerated, since he figures the lower ends of the bulbs as actually on a level with the anterior edge of the perineum. Savage's plate (pl. vi.) corresponds more nearly with the results of most dissections.

are partially covered on their anterior and outer aspects by the bulbocavernosi muscles. Behind their lower ends are the vulvo-vaginal glands.

The bulbs, which are regarded as the analogues of the bulb of the urethra in the male, consist anatomically of complicated venous plexuses enclosed in fibrous sheaths. The expression "masses of erectile tissue"¹ frequently applied to them is not strictly correct. Savage is more exact in referring these bodies to the class of erecto-turgescient structures. The chief feature about their gross anatomy is the free communication of their veins with neighboring plexuses. Not only are they intimately connected with each other by the veins of the isthmus, and with the vessels of the clitoris by the pars intermedia, but they communicate freely with the veins of the labia, perineum, and vagina, and even with the plexuses which unite to form the obturator vein, as well as with the epigastric veins. Their arterial supply is derived from branches of the internal pudic. Their nervous twigs are largely derived from the sympathetic system, the nerves accompanying the arteries.

A microscopical section of a bulb will not add much to the information gained by a gross inspection. Externally there is a layer of firm connective tissue, beneath which is a dense mass of veins and tortuous arteries surrounded by fibro-muscular tissue, the histological structure being analogous to that of the erectile tissue of the clitoris, except that the trabeculæ are largely replaced by actual veins.

The vulvo-vaginal glands (glands of Bartholin or Duverney) are small oval bodies, of a reddish-yellow color, varying in size from a bean to an almond, situated on each side of the vaginal orifice near the lower extremities of the bulbs. They lie, as a rule, behind the anterior layer of the triangular ligament² (like Cowper's glands in the male, to which they are analogous), and hence behind the rounded ends of the bulbs. They are situated beneath the superficial perineal fasciæ, in front of the transversus perinei muscles, and between the lower edge of the orificium vaginae and the erectores clitoridis muscles. The glands vary in size in different subjects: they are largest in young women, while in the aged they become atrophied, and may even disappear. Huguier thought that he succeeded in establishing some relation between the size of a gland and that of the ovary on the same side. During sexual excitement these bodies share in the general turgescence of the vulvo-vaginal region. Each gland has a

¹ Ranney, *Annals of Anatomy and Surgery*, April, 1883, p. 4.

² Ranney, *N. Y. Medical Journal*, July, 1882; also *Annals of Anatomy and Surgery*, April, 1883. He admits that they may lie either in front of or behind the posterior layer.

duct, from a half to three-quarters of an inch in length, and less than one-fifth of an inch in diameter, which runs along the inner margin of the rounded extremity of the bulb, and opens into the fossa navicularis on the inner surface of the nymphæ, just in front of the base of the hymen.

Microscopically, the vulvo-vaginal glands belong to the compound racemose variety, their acini, secondary, and discharging ducts being lined by columnar epithelium. Their secretion is a yellowish, tenacious mucus, which acts simply as a lubricant to the parts; its expulsion is favored by the reflex contraction of the surrounding perineal muscles.

PRACTICAL DEDUCTIONS.—Bearing in mind the tegumentary character of the external genitals, the reader will naturally infer that they are subject to many of the same affections as the skin in other portions of the body, and that these are to be referred to essentially the same causes. It is hardly necessary to refer to the risk incurred by the physician while practising the vaginal touch in infected females: there is no more dangerous—because unsuspected—source of infection.

The comparative frequency of hypertrophy of the external genitals is readily explained by reference to their structure: thus, an excessive development of adipose may result in enormous enlargement of the mons or labia, so as to interfere with locomotion or sexual intercourse, while hypertrophy of the skin and fibrous tissue may be still more marked, as in elephantiasis. The contractile character of the tissues not only renders healing difficult after extensive loss of substance from wounds, sloughing, the ravages of rodent ulcer, etc., but leads to the formation of large, ugly cicatrices. Hence the danger (aside from that of hemorrhage) which follows the excision of large tumors.

Inflammatory affections of the vulva are seldom confined strictly to this region, but involve the lower end of the vagina, and frequently the urethra, because of the direct continuity of the mucous membrane; conversely, inflammation of the vagina, especially when of a specific character, generally extends to the nymphæ. The extreme pain and hyperæsthesia which attend eruptions and inflammation of these parts, frequently out of proportion to the local trouble, afford a striking clinical proof of their rich nerve-supply, while the reflex symptoms that sometimes result from an insignificant eruption would be inexplicable did we not recall the intimate relation between the cerebro-spinal and sympathetic nerves, which is by no means confined to the internal genitals. Burning and itching sensations about the vulva may thus cause a considerable amount of general disturbance. A familiar illustration of this is offered in the sensitive red patches which are seen on the inner surfaces of the nymphæ in women who have passed the climacteric, especially in connection with urethral caruncle.

The extensive anastomoses of the pudendal veins with the pelvic plexuses, as well as their connection with the erectile system, explain the alarming hemorrhages which occasionally follow wounds of the labia, the excision of cysts and tumors, operations on the perineum, etc. The surgeon need not anticipate any considerable arterial bleeding in this region, although secondary venous oozing is by no means uncommon, especially if one of the vaginal bulbs be wounded. Most of the fatal cases reported resulted from the rupture of dilated veins. This dilatation is best observed during pregnancy, when the labial plexuses are mapped out more clearly than in the most carefully injected anatomical preparations. A rupture of one of these varicose vessels, either by an injury from without or by the pressure of the child's head during parturition, results in the formation of a labial thrombus which may attain a large size. The rapid development of œdema of the external genitals in connection with general venous obstruction and anasarca is another striking evidence both of the vascularity of the parts and of the free communication of the veins with the deeper vessels.

The possibility that a tumor of the labium may be a hydrocele or hernia (even of the ovary) will be evident to the reader who recalls the relation which the part bears to the inguinal canal as the analogue of the scrotum. It is often difficult to apply the ordinary rules of differential diagnosis because of the thickness of the adipose tissue covering the tumor.

It has been stated that the vestibule is entirely concealed by the apposition of the labia majora when the thighs are closely approximated. In order to examine this region, then, it is necessary to separate the knees widely and to hold the labia apart. The inexperienced examiner will be disappointed not only at the small size of the clitoris, but at the indistinctness of the meatus urinarius. The small "tubercle" which is said to form a sure guide to the meatus is quite as often absent as present, while prolapse of the mucous membrane of the canal, polypi, etc. may cause a complete alteration in the usual feel of this region. In passing a catheter by the sense of touch the physician will do well to disregard the rule laid down in most of the textbooks on obstetrics, and, instead of searching the vestibular area for a "guide" to the meatus, to look for it at once in the median line immediately above the vaginal outlet. Introduce the fore finger into the vagina, with the volar surface uppermost, locate the meatus, and pass the catheter along the finger as a guide. In this way we not only avoid entrance into the vagina, but can feel and direct the instrument as it glides along the urethra. It should not be forgotten that the glandulæ vestibulæ minores, which lie one on either side of the urethral opening, may become enlarged, forming culs-de-sac admitting the tip of a catheter.

Although the sensitiveness of the clitoris has undoubtedly been exaggerated, it is desirable to avoid fingering it during a vaginal examination: this may always be accomplished by sweeping the finger over the perineum to reach the vulvar orifice, instead of beginning at the vestibule and passing it downward. The clitoris may become the seat of epithelioma or hypertrophy, so that excision of the organ is indicated: as a smart hemorrhage may follow a wound of the dorsal artery, the galvanic éraseur is usually preferable to the knife.

The surgical anatomy of the vulvo-vaginal glands is not without interest. They may become enlarged from simple cystic dilatation, or as the result of inflammation extending from the vaginal mucosa, which is continuous with the lining membrane of the gland and its duct. Under the latter circumstances the presence of gonorrhœa should be strongly suspected. The danger of severing the duct of the gland in the minor obstetric operation known as "episiotomy" has been exaggerated: the accident could only occur through carelessness or want of skill on the part of the accoucheur. The same remark will apply to the operation of perineorrhaphy.

Having considered the external genitals, we shall next proceed to the description of the vagina, which forms a connecting link between these and the internal generative organs.

VAGINA.

SYNONYMS.—Vulvo-uterine canal; *Gr.*, *ἔλκτρον*; *Lat.*, vagina, sinus muliebris; *Fr.*, vagin; *Ger.*, Scheide; *It.* and *Sp.*, vagina.

DEFINITION.—The vagina is a musculo-membranous canal of variable dimensions, situated between the bladder and rectum, extending from the uterus to the vulva. It is attached below to the ischio-pubic rami; above, it surrounds the cervix uteri, with which it is continuous.

The direction of the vaginal canal varies in different subjects according to the position (especially the degree of inclination) of the symphysis pubis. Its normal axis, as obtained with the bladder empty, forms with the long axis of the uterus an angle described by some anatomists as a right angle, by others as an obtuse, the degree of obtuseness being determined by the amount of distension of the bladder. When the woman is in the recumbent posture the direction of the vaginal axis is nearly horizontal, while in the lithotomy position it forms an inclined plane extending downward and backward from the vulva. De Sinéty claims that the axis of the vagina is rectilinear, and that it is not correct to represent it by a curved line corresponding with the axis of the pelvis, as is done in most works on obstetrics.

The vagina has been aptly termed "a mucous slit in the pelvic floor," since, when it is not artificially distended, its anterior and posterior

walls are in close contact, and it appears in a mesial section of the pelvis as a line convex anteriorly. On cross-section it is represented by a slit, transverse or crescentic in an infant, but H-shaped in an adult, the longitudinal limbs of the H being convex on their inner aspects, the horizontal limb projecting a little anteriorly. The canal when distended shows a gradual increase in size from the hymen to the uterine junction, so that a plaster cast of a nulliparous vagina bears a certain resemblance to a truncated cone. In multiparæ it is capable of great distension and its shape is extremely variable. The length of the canal varies from seven to eleven centimeters, the average being seven and a half. The posterior wall is from one to two and a half centimeters longer than the anterior. The transverse (and antero-posterior) diameter varies in nulliparæ from three to four centimeters, in multiparæ from six to seven. Before entering upon the anatomy of the vagina it is desirable to glance at the structure which forms its lower boundary.

HYMEN.

SYNONYMS.—Virginal membrane; *Gr.*, ὑμῆν; *Lat.*, claustrum virginal, valvula vaginæ, zona castitatis, etc. etc.; *Fr.*, hymen; *Ger.*, Hymen; *It.*, imene; *Sp.*, himen.

DEFINITION.—The hymen is a circular or crescentic fold of connective tissue, covered by mucous membrane, which immediately surrounds the orifice of the vagina and forms the lower extremity of that tube.

The hymen is almost invariably spoken of as “a fold of mucous membrane” which partially closes the orifice. Budin proved conclusively that it is anatomically a folding in of the *entire* vaginal wall.¹ His arguments may be stated briefly as follows: 1. After removing entire the genital organs of an infant, if the vulva is detached and the labia minora are divided transversely the hymen disappears, but it reappears on restoring the parts to their original condition; that is, the vagina is like a glove-finger which has a circular opening at its lower extremity; 2, the ridges and columns of the vagina are continued on to the hymen as far as its free edge; 3, the histology of the hymen, which has been carefully studied by De Sinéty, shows clearly that it is not an independent fold of mucous membrane; 4, in the fœtus there is an interval of several millimeters between the vulvar and vaginal openings. The hymen surrounds the latter at as early a period as the end of the fourth month. As the fœtus develops the vaginal orifice approaches the vulvar, until the hymen finally reaches the inner border of the nymphæ. It is interesting to note the fact that the first trace of this fold in the embryo is represented by minute excrecences on the posterior vaginal wall.²

¹ *Progrès méd.*, Aug. 1879, p. 677; also Ledru, *Thèse de Paris*, 1855.

² *Am. Journ. Obstet.*, 1878, vol. xii. p. 205.

Gross Appearance.—The hymen ordinarily appears as a crescentic fold situated at the posterior part of the introitus. It lies loosely against the posterior vaginal wall, “like a jib bellied by the wind,”¹ and does not assume the appearance of a tense membrane stretched across the orifice unless the thighs are widely abducted so as to separate the sides of the canal. So little obstruction does this variety of hymen offer to the introduction of a foreign body into the vagina that it frequently persists after repeated acts of coitus. Budin² states that in the course of a single year he found this structure intact in no less than seventy-five primiparæ who were examined during labor, so that he goes so far as to say, “Ce n’est pas le mari, mais l’enfant, qui a enlevé à sa mère ce qu’on considère comme les marques physiques de la virginité.” On the other hand, the hymen is by no means constant. Mauriceau and Buffon deny its existence.

Several forms of hymen have been described, the most common being the crescentic; the annular, which forms a complete ring around the vaginal outlet, with a central aperture; the cribriform, which is perforated by several small holes; and the fimbriated type, which has a fringed edge. The imperforate variety is of course pathological.

It is unnecessary to refer to the medico-legal importance of this structure, since it is an accepted fact that neither is its presence an absolute proof of chastity in its possessor, nor, on the other hand, does its rupture imply that sexual intercourse has taken place.³ Schroeder has made a careful study of the appearance presented by the hymen after rupture. (For a detailed account of these, accompanied by drawings, the reader is referred to his original article.⁴) The important fact to remember in this connection is that the so-called *carunculæ myrtiformes* do *not* represent the remains of the hymen after its rupture. It would seem superfluous to refer to this error were it not still retained in popular textbooks. A superficial examination of the hymen in a married woman who has never borne children will invariably reveal the fact that this structure persists just as truly as in the virgin. The *caruncles* are irregular, fleshy protuberances skirting the vaginal orifice, and are the remains of the sloughing and cicatrizing processes that result from childbirth. A careful examination of these masses will show that they vary greatly in their size and shape, appearing sometimes as mere tags of tissue, sometimes as distinct polypi, which result from injury to the vaginal wall as well as the hymen. As a consequence of labor the line of demarkation between the vulva and vagina is obliterated, the latter being really “unfolded,” to use Budin’s expression, so that its

¹ Foster, *op. cit.*

² *Des Lésions traumatiques chez la Femme, etc.*, 1878.

³ Comp. Thomas, *N. Y. Med. Journ.*, 1859, vol. vi. p. 196.

⁴ See *Edinburgh Med. Journ.*, 1877-78, vol. xxiii. pp. 906-910, for translation.

lower extremity (the hymen), instead of forming a prominent fold five or six millimeters in width, is flush with the wall of the vulva.

ANATOMY.—A. *Gross*.—Although it presents the appearance of a thin membrane when viewed from the front, a cross-section of the hymen has a somewhat triangular outline, the base of the triangle resting upon the vaginal wall, while its apex corresponds with the free edge. As will be seen even with the naked eye, the hymen consists of a double fold of mucous membrane, between which is a delicate layer of connective tissue that is directly continuous with that of the vaginal wall. Numerous blood-vessels may also be traced from the vaginal plexuses into the hymen, in which they ramify as far as its free edge.

B. *Minute*.—The mucous membrane is covered by a layer of pavement epithelium, that on the upper surface of the hymen being continuous with the vaginal epithelium, on its lower surface with that of the vulva. Beneath the epithelial layer is a dense network of fibrous tissue, in which are numerous elastic and a few smooth muscular (?) fibres. Many papillæ extend upward into the epithelial layer. Not only is there a rich capillary plexus in the midst of this tissue, but numerous fine nerve-fibrils will be seen under the microscope, the ultimate terminations of which are not certainly known. All of these structures may be traced from the vaginal wall.¹

WALLS OF THE VAGINA.—There are two, the anterior and the posterior: both have a somewhat triangular shape, the bases of the triangles being uppermost. The former extends from the upper edge of the orificium vaginæ to the cervix, in front of which it expands to form the anterior cul-de-sac. Its length averages five centimeters, the lower three centimeters being intimately united with the urethra and neck of the bladder, forming the urethro-vaginal septum. The anterior cul-de-sac is a shallow pouch in front of the cervix which varies in depth according to the amount of inclination of the uterus. The mucous membrane covering the anterior wall is thrown into numerous folds or projections, which are most marked near the vulva and gradually disappear toward the upper end of the canal. These folds are distinguished as temporary and permanent, the former disappearing when the vagina is distended. The latter consist of series of transverse ridges that extend obliquely upward and outward from a median longitudinal ridge known as the anterior column. The transverse cristæ are themselves composed of still smaller secondary ridges, which are covered with papillæ. The anterior column may begin immediately behind the meatus or at the

¹ Budin's view of the origin of the hymen is not universally accepted. Pozzi (*Gaz. méd. de Paris*, Feb. 23, 1884, p. 86) believes that it is an outgrowth from the fetal sinus urogenitalis, and hence that it is really a part of the vulva. He regards the hymen as the analogue of the bulb of the urethra in the male.

small tubercle below it, and it generally disappears at the upper third of the vagina. It is not infrequently divided into two parts by a median longitudinal groove; the opposite halves may remite. This column may be situated laterally. The ridges are most prominent in the newborn and in virgins; in the latter they are remarkably firm to the touch. They disappear to some extent after childbirth, especially at the upper part of the canal, but they may persist near its lower end in the form of prominent papillæ.

The posterior vaginal wall extends from the lower edge of the orifice to the cervix, behind which it forms the deep pouch known as the posterior cul-de-sac. Its average length is seven and a half centimeters. The lower four-fifths of this wall is loosely connected with the rectum, forming the recto-vaginal septum. There is a posterior column with transverse ridges extending outward from it, but these are not so prominent as those on the anterior wall.

The roof, or fornix, of the vagina is the upper part of the tube where it surrounds the cervix. Its extent and peculiar dome-like appearance are only seen when the canal is dilated, the anterior and posterior walls being normally in contact with the cervix. The posterior cul-de-sac, or fornix, has at least twice the depth of the anterior, on account of the higher attachment of the vagina behind the cervix. This difference is not appreciated on viewing the vagina and uterus externally, because of the intimate union between the two organs. The lateral fornices are simply the portions of the vaginal roof which lie on either side of the cervix; they have no appreciable depth, and serve to connect the anterior and posterior culs-de-sac. The important relations of the latter will be mentioned subsequently.

It is unnecessary to give more than a passing reference to the changes in the vagina which ensue from senile involution—shortening of the longitudinal and transverse diameters, narrowing of the entire canal, atrophy of the mucous membrane, with obliteration of the rugæ—or to the general hyperplasia which results from pregnancy. It shares in the changes which occur in all of the pelvic organs under the conditions mentioned.

ANATOMY.—A. *Gross*.—The wall of the vagina consists of three layers—an external, composed of connective tissue; a middle, of unstriated muscle; and an inner mucous layer. The connective tissue serves to unite the vagina firmly to adjacent organs; in fact, Cruveilhier does not regard it as belonging properly to the wall of the canal. It serves also to support the external plexus of veins. The fibres of the muscular layer do not form distinct strata, but interlace; they have, however, been divided into two sets, those having a general longitudinal direction, and those which are circular or oblique. Authorities differ as to the relative position of the fibres, some stating that the innermost

ones are longitudinal,¹ while Breisky² affirms that they are usually circular. He admits that in the anterior columns the former arrangement prevails. Luschka³ describes a bundle of striated muscular fibres which surrounds the lower end of the vagina and also encircles the urethral orifice (sphincter vaginae).

The mucous membrane of the vagina varies in thickness from one to one and a half millimeters, and extends from the free edge of the hymen to the cervix uteri, over which it is reflected. Its color is normally rosy red, but it may vary from a light pink to a dark purple or slate color, the latter hue frequently appearing during pregnancy. It is closely united to the subjacent muscular layer, and is disposed in the form of columns and transverse ridges, as before mentioned: a section through one of the columns shows that the mucous membrane is much thicker here than it is in the hollow between the ridges, and that it is also more vascular. Numerous papillae cover the mucous surface; these increase in size during pregnancy. A small amount of acid mucus is normally present on the walls of the vagina. The secretion is augmented during pregnancy and the menstrual period. The vaginal wall has not the same thickness throughout. At the upper part of the canal it measures from two to three lines, while near the outlet it is from five to six lines thick. This difference is due to the variation in thickness of the muscular layer.

Vascular Supply.—The vagina receives arterial branches from several sources. Besides the vaginal arteries, which spring generally from the anterior divisions of the internal iliaes below the origin of the uterine arteries, and give off several parallel twigs which ramify upon the lateral wall of the tube, branches from the uterine supply its upper end, while the pudendal arteries send branches to its lower extremity. All of these vessels anastomose freely with one another, with those of the opposite side, and with the uterine, vesical, and rectal arteries. Hyrtl figures an azygos branch which has a longitudinal course along the anterior vaginal wall and empties into the circular artery of the cervix.

The vaginal veins are disposed in the form of plexuses that form complete vascular sheaths around the canal, one being external to the muscular layer, while the other lies just beneath the mucous membrane. These communicate freely with the pudendal, vesical, and hemorrhoidal plexuses below, and with the plexuses of the broad ligament above. Some of these communicating networks have received special names. Thus a collection of veins situated on either side of the fornix has been called the utero-vaginal plexus; another in the vesico- or urethro-vaginal septum, the vagino-vesical plexus.⁴ All of these veins are without valves.

¹ Henle, Klein, and Frey.

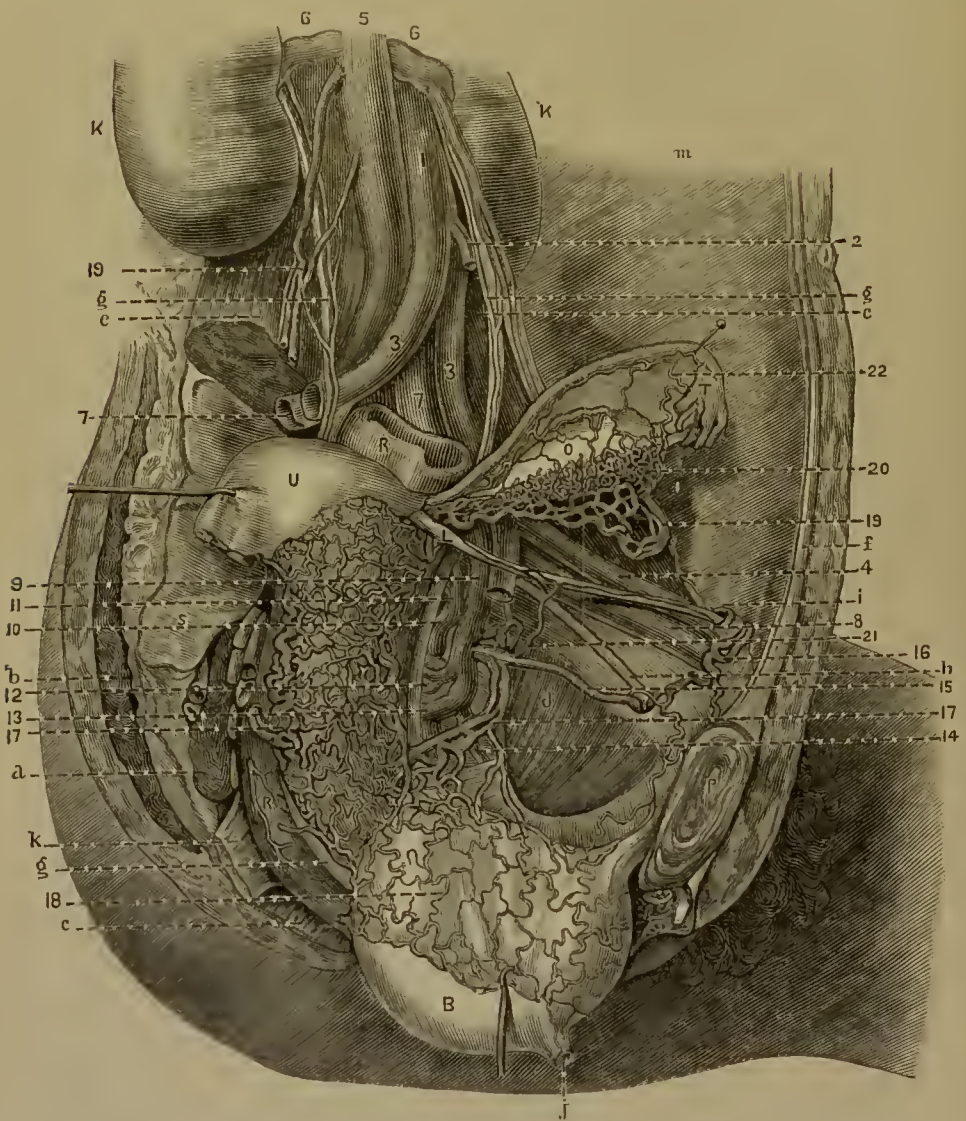
³ *Op. cit.*, p. 387.

² *Krankh. der Vagina*, 1879, p. 7.

⁴ Savage, *op. cit.*, pl. ix. fig. 1.

Lymphatics.—The lymphatics which come from the lower end of the vagina unite with those from the external genitals and enter the ingui-

FIG. 42.

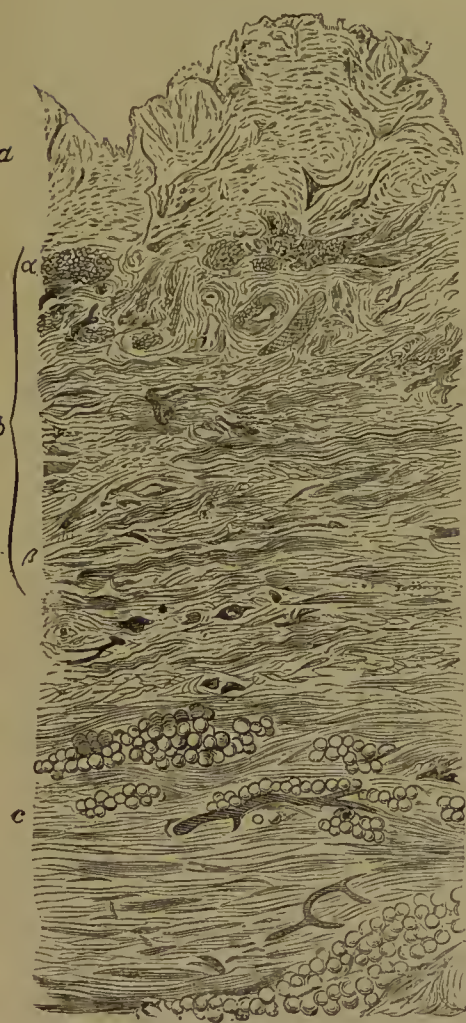


Arteries and Veins of Vagina and Uterus (Savage): *B*, bladder cut at urachus and turned forward; *R*, rectum; *L*, round ligament; *U*, uterus; *O*, ovary; *V*, vagina; *S*, sacro-iliac articulation; *K*, kidney; *F*, Fallopian tube; *P*, pubic symphysis; *a*, pyramidal muscle; *b*, gluteal muscles; *c*, ischio-coccygeus muscle; *d*, internal obturator muscle; *e*, *e*, psoas muscle; *f*, linea alba; *g*, *g*, ureters; *h*, obturator nerve; *i*, internal inguinal ring; 1, abdominal aorta; 2, inferior mesenteric artery; 3, 3, common iliac arteries; 4, external iliac artery; 5, vena cava; 6, renal veins; 7, 7, common iliac veins; 8, external iliac vein; 9, internal iliac artery; 10, gluteal; 11, ileo-lumbar; 12, sciatic; 13, pudic; 14, obturator; 15, epigastric veins; 17, uterine veins; 18, vagino-vesical venous rete; 19, spermatic veins; 20, bulb of ovary; 21, vein to round ligament; 22, Fallopian veins.

nal glands. The vessels from the upper three-fourths of the vagina are joined by branches from the cervix uteri and bladder, and termi-

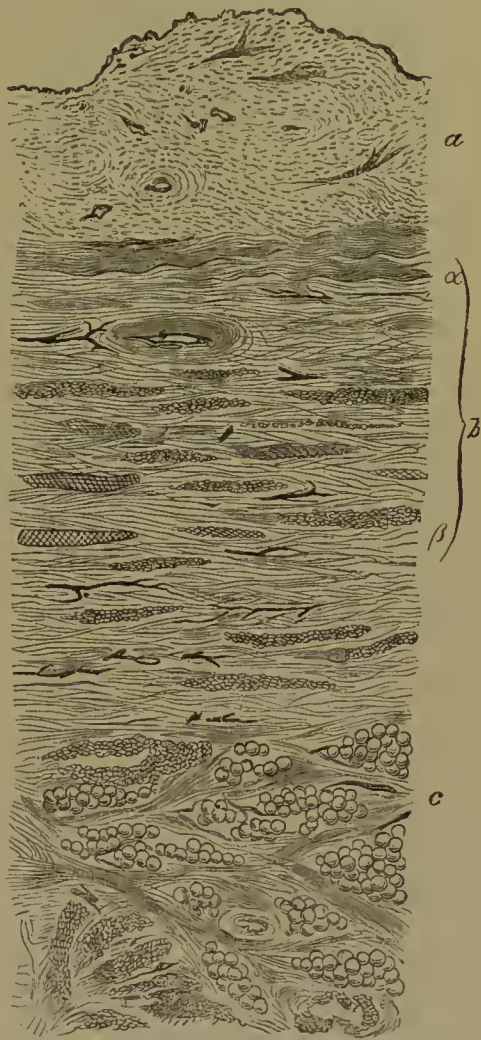
nate in the internal iliac glands.¹ The nervous supply of the vagina is derived almost entirely from the sympathetic system; branches from the inferior hypogastric plexuses form a network around the canal, which is continuous with that which surrounds the uterus.

FIG. 43.



Longitudinal Section of the Vaginal Wall.

FIG. 44.



Transverse Section of the same (Breisky).

a, mucous membrane; b, muscular layer, including α , circular, and β , longitudinal fibres; c, fibrous layer, containing fat.

B. *Minute*.—A cross-section through the vaginal wall presents the following appearance under the microscope: There is an external layer of fibrous tissue, in the midst of which will be seen numerous large veins belonging to the so-called plexus venosus vaginalis. Around

¹ According to Le Bee (*Gaz. hebdom.*, April 15, 1881), the united lymphatics of the cervix and upper part of the vagina run beneath the base of the broad ligament, and open into some small glands around the obturator foramen.

these are bundles of smooth muscular fibres, the presence of which suggests a resemblance to true cavernous tissue. Running with the veins are large lymphatics, some of which are dilated so as to form sinuses. More internal to the fibrous layer is the muscular stratum, in which the outer fibres will be divided more or less transversely, while the inner have a longitudinal course. Between and among these are other fibres that cross one another in all directions. Lymphatic plexuses are distributed between the bundles. Internal to the muscular coat is the submucous layer of loose areolar tissue which supports a second venous network, the vessels appearing to be much smaller than those forming the external plexus, and having a general course parallel to the course of the canal. Another set of lymphatics is present in this tissue, the vessels being relatively of large size and having valves. The mucous membrane of the vagina consists of dense fibrous tissue, in the midst of which are numerous elastic fibres, over which are several layers of stratified pavement epithelium. This mucosa with its epithelium is not only thrown into large folds, but forms secondary elevations or papillæ, in each of which is a capillary loop. In sections of the mucous membrane of the fornix these loops are single, but in the large papillæ that cover the rugæ near the introitus there is quite a complicated vascular network. The rugæ have a different structure from the general mucosa, since they contain large venous plexuses surrounded by bundles of muscular fibres, as in cavernous tissue.

The mucous membrane is richly supplied with lymphatics: Löwenstein has described lymph-follicles similar to those in the large intestine.¹

The existence of true secreting glands in the vaginal mucous membrane has not been positively determined. Von Preusslin² has described tubular crypts or glands in the region of the fornix which are lined with columnar (ciliated?) epithelium. Robin, Cadiat, Sappey, De Sinéty, and many others deny the existence of glands in the vagina, and believe that the vaginal mucus is an exudation from the free surface of the mucosa, and not a true secretion.

Nerves ramify throughout the muscular coat and communicate with one another and with the ganglia that are present in considerable numbers. There is a plexus beneath the epithelial layer, the terminal filaments from which enter structures known as end-bulbs.

RELATIONS.—Anteriorly, the vagina is connected with the *bas fond* and neck of the bladder by means of a quantity of dense areolar tissue. This union, which occurs over the upper half of the vagina, is not as intimate as that between the vagina and urethra, yet the term “vesicovaginal septum” is applied to the entire thickness of the tissues separating the two cavities. It is formed by the anterior wall of the vagina,

¹ *Centralbl. f. med. Wissenschaft*, 1871, p. 546.

² *Virch. Arch.*, Bd. lxx. p. 6.

the posterior wall of the bladder, and the layer of connective tissue between them, in which is the vagino-vesical plexus of veins. The lower half of the anterior vaginal wall is so firmly united to the urethra that the latter is literally "imbedded in it," as Quain describes it, the union resulting in the formation of the "urethro-vaginal septum," which includes the anterior three-fourths of the urethra. The posterior vaginal wall is loosely connected over the middle two-fourths of its extent with the rectum, one or more layers of connective tissue being interposed. The correctness of the term "recto-vaginal septum" as applied to this union has been properly questioned, since the connection is hardly close enough to warrant it. Over its upper fourth the vagina is separated from the rectum by the cul-de-sac of Douglas,¹ while below the level of the pelvic floor the perineal body intervenes between the two canals.

Laterally, the vagina receives the attachment of the pelvic diaphragm—that is, the levatores ani muscles and the fascia covering them—while it is in immediate relation with the large venous plexuses already mentioned.

The relations of the fornix are so important as to deserve a separate description. The anterior cul-de-sac is at least an inch and a half from the vesico-uterine peritoneal fold. Above and well to its outer sides are the ureters, which here bend downward and inward to enter the bladder. The lateral fornices are in relation with the bases of the broad ligaments and the vessels that pass along and below them. The posterior cul-de-sac is covered by the anterior fold of peritoneum which forms the pouch of Douglas,² some areolar tissue being interposed, and descends for an inch or more on the posterior vaginal wall. When the bladder is empty a coil of intestine may rest against the peritoneum covering the fornix.

PRACTICAL DEDUCTIONS.—The hymen presents numerous variations as regards shape, thickness, distensibility, etc. The diagnosis of imperforate hymen should not be made too hastily, since there may be a minute opening sufficient to permit the escape of the menstrual blood, yet so small as to be readily overlooked. It is difficult to form a correct idea of the true size of the hymeneal opening in virgins unless the parts are relaxed by an anæsthetic: such patients should be examined under ether, when the finger may be easily introduced through a vulvo-vaginal outlet which before appeared to be hermetically sealed. The presence or absence of the hymen is now regarded as of small medico-legal importance, except in cases of rape, where evidences of recent

¹ The depth of Douglas's pouch is subject to wide variations within normal limits. De Sinéty states that the peritoneum descends on the posterior vaginal wall only to a distance of 12–15 mm. Tillaux assigns 3 cm. as the average depth of the pouch.

² According to Hart and Barbour, only one-third of an inch of tissue separates the posterior fornix from the peritoneum.

rupture may be significant. It should not be forgotten that an intact fimbriated hymen may simulate rupture. The carunculæ myrtiformes, on the contrary, are of value as pointing to a previous parturition; it is impossible to conceal this sign of childbirth. From its position the hymen shares in inflammatory conditions of the vagina and vulva. When inflamed it is extremely sensitive, as might be inferred from its nerve-supply.

The anatomical relations of the vaginal canal are of extreme importance clinically: it is impossible for the physician to make an intelligent digital examination unless he has them constantly before his mind, while the surgeon will find it necessary to keep his regional anatomy ever fresh. This remark applies particularly to the fornices, which lie in such close proximity to the internal pelvic organs.

The fusion of the urethral and vaginal walls to form the urethro-vaginal septum is interesting surgically. Because of this close union, as well as of the firm connections of the urethra, pure urethrocele, as compared with cystocele, is not common; redundancy of the vaginal tissue is often mistaken for this condition. The thickness of the septum, as well as its vascularity, will be apparent during the performance of the "buttonhole" operation. The looser connection of the bladder with the upper part of the anterior vaginal wall explains the greater range of mobility of the former organ, while the union between the two is sufficiently intimate to render cystocele a common affection. It is important clinically to distinguish prolapsus vaginæ (or descent of the vaginal wall *without* the bladder) from cystocele: the former usually accompanies prolapsus uteri, and, as the reader must infer from his knowledge of the anatomical relations, is a rare condition. In many cases of supposed prolapsus uteri in old women the displacement is really a cystocele vaginalis due to loss of tone of the tissues, which will not be corrected by simply elevating the uterus with tampons or pessaries.

The surgeon finds a convenient access to the base of the bladder through the vagina, cystotomy and lithotomy being simple operations in the female: the hemorrhage is insignificant, and there is no danger of wounding important structures as long as the incision is made vertically and in the median line.

The anterior fornix is a region of far less importance than the posterior. Through it the body of the uterus is distinctly felt when that organ is in a position of physiological anteversion, while the angle in cases of ante flexion is apparent to the least practised touch. Fibroids on the anterior aspect of the uterus, enlargement of the organ from various causes (especially pregnancy), the presence of the fœtal head,—all these objects are accessible through the anterior fornix, especially with the patient in Sims's position. Surgically, we may be called upon

to open the anterior pouch in the operations of supravaginal excision of the cervix and vaginal hysterectomy—a procedure requiring some care, not so much from the danger of prematurely opening the peritoneal cavity and injuring the intestine, as from the liability of entering the bladder. The peritoneum lies high up out of the way, but the bladder is so near to the line of incision that the only safety lies in keeping close to the uterus, while the exact position of the bladder is indicated by introducing a sound into it. The reader who witnesses for the first time this stage of a kolpo-hysterectomy will be surprised at the comparative ease with which the bladder can be separated from its utero-vaginal connections, as well as at the slight amount of bleeding. The peritoneal cavity has been opened through the anterior fornix for the removal of a small subperitoneal fibroid.¹

The bases of the broad ligaments are directly accessible to the examining finger through the lateral fornices—a point of importance clinically, since it enables the gynecologist to determine the presence of inflammatory processes or their results (adhesions) extending outward from a lacerated or epitheliomatous cervix. The pulsations of the uterine artery can often be felt through the vaginal roof, especially during pregnancy, while it is not difficult to reach and control both vessels by ligature or forceps as a preliminary step in vaginal hysterectomy: on the other hand, the venous oozing may be copious and impossible to check except by continued pressure.

The anatomical importance of the posterior fornix is evident at a glance. It lies in close proximity to the peritoneal cavity. Remember that the depth of Douglas's pouch is variable, and that the peritoneum may rarely dip down between the rectum and vagina so low as to be wounded in operations on the posterior vaginal wall. On the other hand, the lowest point in the pouch may barely reach the level of the fornix. It is hardly necessary to call attention to the various objects which may be touched through the posterior fornix, since this subject belongs to the section on diagnosis. The distinctness with which prolapsed ovaries may sometimes be felt is quite startling to the tyro, so that he almost forgets that they are separated from his finger by a septum composed of several distinct layers of tissue. The beginner should become perfectly familiar with the feel of the sacro-uterine ligaments, so that he will not infer the presence of inflammation in them simply because they happen to be better developed than usual. As to the question of the presence or absence of coils of small intestine in Douglas's pouch, the reader need only observe that if the posterior cul-de-sac be opened through the vaginal roof, the patient being on her back, the proximity of the intestine will frequently be demonstrated in a manner unpleasant to the operator. Practically,

¹ Mann, *Am. Journ. Obstet.*, June, 1885.

then, vaginal hysterectomy is best performed with the woman in the left lateral posture, so that the intestines may gravitate away from the cul-de-sac. The nearness of the gut to the vaginal roof is proved by the occasional occurrence of enterocele. The frequency of suppuration in the subperitoneal space adjacent to the posterior fornix, and the tendency of abscesses to point in this region, are well known. Not only a pelvic abscess, but a peritoneal effusion or an intrapelvic cyst, is easily reached by the aspirator-needle through the vaginal roof. Vaginal ovariectomy or salpingotomy is a tempting operation in many cases, but its difficulties are much greater than they appear: the operator can never be sure that in allowing the stumps to retract into the cavity he has not released some bleeding vessels which cannot be secured. Theoretically, drainage through the vaginal vault should be perfect; practically, it is not, and the danger of sepsis is great. Abscesses and suppurating adherent cysts are not always opened with impunity through the fornix: severe hemorrhage occasionally follows the use of the knife; hence the thermo- or galvano-cautery is preferred by careful operators.

The posterior vaginal wall is more liable to become prolapsed than the anterior, since it is connected with the rectum, as low as the apex of the perineal body, by the recto-vaginal process of the pelvic cellular tissue: that this process is hardly thick enough to constitute a distinct septum will be evident on passing the finger into the rectum.

The attachments of the vaginal tube are important. By reason of its union with the cervix uteri any pressure or traction exerted upon either fornix is transmitted directly to the cervix and indirectly to the body of the uterus. Hence pressure upon the posterior fornix (by tampons or pessaries) tends to draw the cervix backward and to throw the body forward, and, conversely, distension of the anterior fornix by a foreign body will tend to lift the anteverted fundus to a slight extent as the cervix is drawn forward. The practical application of this generally accepted fact is this: A movable uterus (ante- or retroverted) is affected by a pessary or tampon, while with an ante- or reflexed organ the angle of flexion is simply increased by distending either fornix.

It is well to bear in mind the level at which the vaginal roof is attached to the cervix, and the fact that, as the result of contraction following old lesions, the infra- and supravaginal portions of the cervix may be practically continuous. In repairing a laceration of the cervix which has involved the vaginal roof, a careless operator might readily open into the subperitoneal cellular tissue and expose his patient to the chance of septic absorption. When the cervix is atrophied and the laceration has been deep, resulting in the formation of an extensive cicatrix, the accident is not an uncommon one. Fortunately, complications are rare if the sutures are carefully inserted and antiseptic injec-

tions are thoroughly used. In amputation of the cervix (for hypertrophy or epithelionia) it is easy to remove at the same time a portion of the vaginal roof, and thus to open into the subperitoneal or peritoneal cavity—an accident which is fortunately not followed by fatal consequences so often as might be supposed.

The relations of the vagina to the pelvic diaphragm will be considered in another place.

A few of the general features of the canal deserve mention. We have seen that it is normally a slit, not an open tube; it assumes the latter character only when its walls are artificially separated. The phenomena observed on retracting the posterior wall by the finger or a speculum, as well as the influence of posture on the size and direction of the vagina, are familiar to every one through the classical description of Sims. Some idea of the resistance offered by the pubo-coxycygeus muscle may be gained by endeavoring to examine a patient with vaginismus before and after an anæsthetic has been administered. The great distensibility of the vagina is seen during parturition; but it should not be forgotten that in distending it encroaches upon both the rectum and urinary tract. In tamponing for uterine hemorrhage, therefore, the tampons should be so arranged that pressure is exerted upon the former rather than upon the latter canal. Advantage is taken of the distensibility of the posterior fornix in the treatment of retroflexion of the uterus with fixation and prolapse of the ovaries. Crude and mechanical as this method is, no better way of gradually stretching (or causing the absorption of?) old adhesions has yet been devised than the application of pressure through the vaginal roof by means of tampons. Doubtless some brilliant results are obtained in this way, but careful observations at the examining-table, as well as experiments in the dead-house, have convinced the writer that it is frequently impossible to dislodge an imprisoned uterus or ovary by pressure exerted from below through the posterior fornix. Whoever devises a safe and scientific method of overcoming this difficulty will deserve a place only a little lower than that of the pioneers of abdominal surgery.

It is surprising how the posterior fornix may be "ballooned out" as the result of long-continued packing: a pouch so shallow that it will not retain a pessary may in this way be deepened to the extent of from one to two inches. A slight amount of reflection will convince the reader that by introducing the plug with the patient in the knee-chest position he will obtain the assistance of gravity, both in replacing the pelvic viscera and in deepening the posterior fornix.

The thinness of the vaginal walls (two or three lines) should not be forgotten during operations for rectocele and cystocele. It is a fact of common observation that in denuding, as soon as the mucous membrane has been removed, the surgeon reaches immediately the large submucous

venous plexus, which it is desirable not to wound. Whether, as Dr. Emmet believes, it is possible to penetrate the entire thickness of the vaginal wall with a needle in posterior colporrhaphy, and to catch up the torn fascia outside, it is impossible to decide, since no dissections have been made for the purpose of proving this statement. In spite of the instructions which are given in descriptions of this operation, it is probable that in most instances it consists essentially in merely taking a reef in the redundant vaginal mucous membrane. The marked tendency of the tissues to stretch proves a source of annoyance to the surgeon, who frequently finds that a few months after the performance of plastic operations, undertaken with the view of narrowing the canal, its calibre is nearly the same as before.

The continuity of the vaginal mucosa with that of the uterus and Fallopian tubes is an anatomical fact of extreme practical importance. Gonorrhœa is a serious affection in the female: the physician who, in the light of our present knowledge of tubal pathology, continues to regard it as an insignificant local inflammation is certainly not abreast of modern ideas. One of the chief reasons why gonorrhœa in the female is such a chronic affection is because there are so many folds in the vagina which are not reached by the local applications and injections.

The normal rugosities of the vagina are sometimes so marked that they may be regarded as pathological: the distribution of the papillæ and follicles is well shown in granular vaginitis, a condition often present during pregnancy. Cysts, resulting from dilatation of the mucous follicles, are not very common: they are usually found near the ostium, and should not be confounded with enlargements of the vulvo-vaginal glands. They may be incised and the lining membrane touched with a caustic, or the cysts may be dissected out entire: in the latter case the caution with regard to the thinness of the vaginal wall will not be unheeded. The same applies to operations for the removal of polypoid tumors, to curetting for primary and secondary epithelioma, etc.

The remarks concerning the nerves and vessels of the external genitals apply also to those of the vagina. The reflex symptoms observed in vaginismus furnish sufficient evidence of the continuity of the pelvic nerve-plexuses. The phenomena may be due to some cause entirely outside of the vagina. There being two sets of valveless veins in the vaginal wall, which communicate freely with the deeper plexuses, any obstruction to the pelvic circulation or general engorgement will at once affect the former. The blueness of the mucous membrane of the vagina during early pregnancy is sufficiently familiar, yet ovarian and uterine tumors or prolapsus may cause the same appearance. During operations on the perineum and posterior wall, when the patient is profoundly etherized the submucous plexuses appear

greatly distended as the mucous membrane is removed. Wounds of the vagina often give rise to profuse venous hemorrhage, especially during pregnancy and parturition.¹ It is better to pass a suture under the bleeding vessel than to endeavor to isolate it or to ligate *en masse*. Hot water is an excellent styptic during plastic operations. On the same principle, copious injections of water at a high temperature (110° F.), the hips being elevated in order to favor the return of the venous blood, frequently cut short an attack of acute vaginitis. Even those who question the antiphlogistic action of hot water in deep intrapelvic inflammation will not doubt its value in cases where it can be applied so directly to the affected spot.

The union of the lymphatics of the lower fourth of the vagina with those of the external genitals has already been mentioned. Le Bee's statement that the lymphatics of the upper three-fourths of the canal unite with those of the cervix and pass below the broad ligaments to the obturator glands, and that they communicate freely with the inguinal glands, seems to be borne out clinically by the fact that the latter are commonly involved in malignant disease of the upper portion of the canal. The hopelessness of effecting a radical cure in such cases is sufficiently evident. The blood- and lymphatic-supply of the cervix and upper part of the vagina being practically the same, it is evident that the prognosis in malignant disease, as regards its extension to surrounding tissues, will be nearly identical for both regions.

UTERUS.

SYNONYMS.—*Eng.*, womb; *Gr.*, *δστέρα*; *Lat.*, matrix; *Fr.*, matrice; *Ger.*, Gebärmutter; *It.*, matrice; *Sp.*, matriz.

DEFINITION.—The uterus is a hollow, thick-walled organ, shaped like an inverted truncated cone, occupying the middle of the pelvic cavity between the bladder and rectum.

POSITION.—The normal position of the uterus has long proved a fruitful subject for discussion among both pure anatomists and gynecologists. It will be impossible to rehearse in such a brief paper as this the results of the many investigations that have been made in order to determine a point which at the first glance appears so simple.²

Much of the difference of opinion on this subject has arisen from the fact that observers have sought to assign arbitrarily a certain definite position to the uterus, and have not made due allowance for the influences exerted upon it by neighboring organs. It must be evident to

¹ Compare paper by Dr. Mann on "Surgical Operations on the Pelvic Organs of Pregnant Women," *Gynecological Transactions*, vol. vii.

² For the literature of the subject the reader is referred to Hart and Barbour's *Gynecology*, chap. ii., and to the list of authors appended to Ranney's *Topog. Relations of the Female Pelvic Organs*.

any one who has studied the pelvic organs in the cadaver that no dissections or frozen sections, however carefully they may be made, can ever present a perfect picture of the relation of these organs as they appear in the living subject. The elasticity of the tissues is lost, and the uterus, deprived of its natural supports, which are so nicely balanced during life, must necessarily assume a position far different from that which it once occupied. In short, such results as those obtained by Schultze and Kohlrusch, as proved by their figures,¹ will go far to convince the reader that clinical observations are more likely to give a satisfactory solution of this question than are pure anatomical studies. Still more reliable are those results which are obtained by a judicious combination of both methods. It is sufficient for practical purposes to state that, with the bladder and rectum empty, the uterus is normally in a position of slight ante flexion, the os externum being directed downward and backward, and the entire organ having an inclination toward the right side.² To what extent its anterior surface is in contact with the posterior aspect of the bladder (as affirmed by Hart and Barbour) is not clear, nor is it of any practical importance. It is well known that the uterus possesses a considerable range of mobility, its position varying according to the amount of distension of the bladder.³

When viewed from above the uterus appears as a pear-shaped body, somewhat flattened from before backward, so that its anterior surface is nearly plane, the posterior being distinctly convex. It tapers gradually to a point near its middle, where there is a slight depression (most marked on the posterior aspect) that represents the line of demarkation between the body and the cervix. This sulcus is not seen when the uterus is observed *in situ* in the living body or when it is injected after its removal. The fundus uteri lies either just below or on a level with the plane of the pelvic brim: the tip of the cervix, according to Savage, "marks nearly the centre of the pelvic cavity—the centre of a general radius of about two inches."

DIMENSIONS.—The entire length of the unimpregnated uterus is about three inches, the cavity of the organ measuring between two and two and a half; a little less than two inches belong to the body. The transverse measurement at the level of the Fallopian tubes varies from one and a half to two inches; that at the constricted portion, or isthmus, from one-half to one inch. The average antero-posterior diameter of the organ is about an inch. The weight of the virgin uterus varies from seven to twelve drachms. The sulcus before alluded to separates

¹ Hart and Barbour's *Gynecology*, figs. 50, 51.

² There is doubtless truth in Luschka's idea, that muscular fibres in the utero-sacral ligaments (called by him the retractores uteri) assist by their contraction in maintaining the uterus in a position of anteversion (*Anatomic der Weiblichen Beckens*, p. 361).

³ Compare Van de Warker's papers, *N. Y. Med. Journ.*, vol. xxi. p. 337; *Am. Journ. Obstetrics*, vol. xi. p. 314.

the uterus into two portions—the upper, pyriform mass being called the body; the lower, spindle-shaped portion, the cervix. That part of the body which lies above a line joining the proximal ends of the Fallopian tubes is known as the fundus. The cervix has been further subdivided by Schroeder into three segments, the upper and lower of which are called, from their relation to the point of attachment of the fornix vaginae, the supra- and infravaginal portions, while an intermediate zone of rather indefinite size is assumed as existing between them.

It is sufficient for practical purposes to consider the cervix as consisting of two parts—an upper, which lies above the vaginal vault, and a lower, which is below it. The supravaginal portion of the cervix extends from the isthmus to the roof of the vagina; its transverse diameter is a little less than an inch, its antero-posterior half as great. The relations of this segment of the uterus are important, and will be described later. The infravaginal segment of the cervix is most interesting to the gynecologist, because it is the only part of the uterus which is directly accessible to the eye and finger. Its size and appearance are extremely variable, according to the age and sexual activity of the subject. In the virgin the cervix appears as a small conical projection about one-third of an inch in length, having a smooth, firm feel. Its apex measures seven or eight lines transversely and five in its antero-posterior diameter. At its centre is the external os (*os tinea*), a small opening or slit one or two lines in width, situated between the anterior and posterior lips and directed backward. The anterior lip is considerably longer than the posterior, although from the depth of the posterior cul-de-sac and the greater distance of the posterior lip from the ostium the reverse seems to the true.

The cervix in nulliparous married women is usually larger than in virgins; its conical shape is less marked, the os is more open, and the lips have a softer feel. It is a question as to what changes may occur in the cervix within strictly normal limits as the result of parturition. In multiparae the lips are softened and increased in size, and the os is an irregular opening, around the edges of which are small irregularities and cicatrices, even where no actual laceration has occurred. It should not be forgotten that certain pathological conditions, such as cervical endometritis, may lead to eversion of the lips and an irregular, gaping os—appearances which closely simulate the results of childbearing. In consequence of senile atrophy the lips may become so shortened that they seem to be almost flush with the vault of the vagina.

The body of the uterus includes that portion of the organ which lies above the isthmus. Its form and dimensions have already been referred to. It has two surfaces and three borders. Of the former, the anterior surface is flattened, the posterior convex. The upper border, which is convex, is continuous with the upper surfaces of the Fallopian tubes.

The lateral borders are convex at the upper portions, but become concave at the isthmus. At the superior angles of the uterus (where the lateral pass into the upper border) are the origins of the tubes; just below these are the attachments of the ovarian ligaments, while still lower the round ligaments arise. Besides their relations to these structures, the lateral borders are intimately connected with the broad ligaments, and especially with the vascular plexuses that lie between their folds. The arteries, veins, and lymphatics enter and leave the uterus at these borders. The body of the nulliparous uterus is smaller than that of the multiparous, and is more distinctly flattened antero-posteriorly, while the triangular outline is more apparent.

The uterine cavity is not strictly a cavity at all in the normal organ, since its anterior and posterior walls are in contact. As studied in a coronal section, it consists of two portions, between which is a constriction (the isthmus). The cavity of the body has a triangular shape, the apex of the triangle being at the isthmus, while at each end of the base is the opening of a Fallopian tube. A third opening (os internum) leads from the cavity of the uterus into that of the cervix. The latter is fusiform before childbirth, conical afterward; at its upper end is the os internum, while the os externum forms its lower limit. The length of the entire uterine cavity averages two and a half inches, its width one and a half, the antero-posterior diameter of the corporeal cavity nine-tenths of an inch, while that of the os internum is three-eighths of an inch. The entire capacity of the uterine cavity is two or three cubic centimeters (Sappey). The internal lining of the corporeal cavity is smooth, that of the cervix is corrugated. As in the vagina, there is a longitudinal ridge on both the anterior and posterior walls, from which oblique processes (arbor vitæ uterina) are given off.

ANATOMY.—A. *Gross*.—The uterine wall consists essentially of two layers, the muscular strata and the mucous membrane. The peritoneal covering of the organ, although intimately connected with it, is not really a constituent part of the wall, and will be considered with the peritoneum. The muscular tissue of the uterus is best developed after impregnation, when it may be separated into three fairly distinct layers; hence a minute study of the musculature is more interesting from an obstetrical than from a gynecological point of view. Of the three layers, the external or superficial is most distinct over the anterior and posterior surfaces of the organ, where it is seen as a thin layer (closely adherent to the peritoneum), which sends off prolongations that may be traced between the folds of the broad ligaments (as the ovarian ligaments) and along the round ligaments to their termination in the mons Veneris. Both of these ligaments deserve a separate description.

The former fibres are derived from the posterior surface of the uterus, the latter from that portion of the "platysma" (as it has been appro-

priately named) which covers its anterior surface. The superficial muscular layer of the Fallopian tubes is also derived largely from the latter source. The lateral aspects of the uterus are entirely devoid of this superficial stratum.¹ The middle layer, which is by far the thickest, consists of interlacing fibres, transverse and longitudinal, which are continuous with those of the vagina, having a similar course. Many of the longitudinal fibres, however, cannot be traced beyond the cervix, where they terminate in the connective tissue. This layer constitutes the principal portion of the uterine wall, and is of importance because of the fact that it contains the vessels. These are enclosed within the network of fibres, and may be studied with the naked eye in cross-sections, their intimate relation to the tissue in which they are imbedded being shown by the fact that their walls do not collapse when they are divided transversely.

The thin muscular fasciculi of the internal layer have a general circular direction, which is best marked around the os internum, where they form a so-called "sphincter."² This annular arrangement is also seen around the horns of the uterus, where the circular fibres are directly continuous with those of the Fallopian tubes, and in the cervix at the point of attachment of the vagina. Among the muscular bundles in the latter situation are numerous blood-vessels and lymph-spaces, that run transversely. According to Chrobak, the circular fibres enter the mucous layer, so that the union between the two layers is an intimate one.³

The connective tissue of the uterus is not distributed in the form of definite layers, but appears as irregular masses of fibres which separate the muscular fasciculi and surround the vessels. It is especially rich in the cervix, as will be inferred from its extensive hypertrophy as the result of pathological conditions (laceration).⁴ In the body of the organ a loose areolar tissue is present in considerable quantity in the external muscular layer, where it extends longitudinally, accompanying the bundles of fibres. In the middle layer the individual fibres become finer, while their distribution is circular; they are found almost exclusively around the vessels. The connective tissue of the inner layer is

¹ Vide Savage (*op. cit.*, p. 47) for a minute description of the external layer, which, together with its serous covering, he denominates the "sero-muscular platysma." He appears to regard it as derived almost entirely from the prolongations of the longitudinal fibres of the vaginal wall, which simply pass over the surface of the uterus to enter the utero-sacral, round, and broad ligaments and the Fallopian tubes.

² Hélie, *Recherches sur la Dispos. des Fib. musc. de l'Utérus*, Paris, 1869.

³ Savage (*op. cit.*, p. 45) is almost alone in his positive statement that "the uterine walls are absolutely inseparable into layers or coats, and no sort of formula of arrangement of fibre, as in the case of the heart, is conceivable in respect to them." His observations must have been confined entirely to the unimpregnated organ.

⁴ Comp. Wylie, "Observations on Laceration of the Cervix Uteri," *Am. Journ. Obstetrics*, vol. xv., No. 1, Jan., 1882, p. 20 (reprint).

FIG. 45.



Section of the Mucous Membrane of the Uterus from near the Fundus (Schäfer): *a*, epithelium of inner surface; *b*, *b'*, uterine glands; *c*, interglandular connective tissue; *d*, muscular tissue.

more abundant than that of the median, although the fibrillæ are so delicate that they are not readily appreciable with the naked eye. There is still some difference of opinion among anatomists as to whether these fibres can be traced directly into the mucous membrane or not. We have not the space in which to enter upon a discussion of this question. The fact that there is such a firm attachment of the mucous and submucous strata to the subjacent parts, aside from careful studies of the normal and pathological histology of the uterus, leads the writer to believe that both the muscular and connective-tissue fibres do penetrate the mucous membrane¹ (Fig. 45).

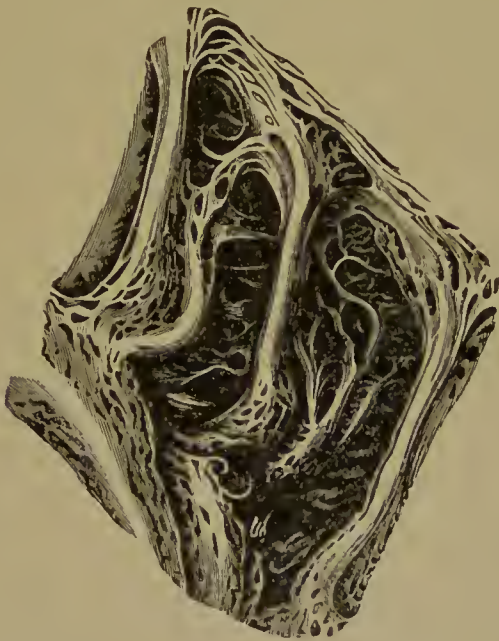
The mucous lining of the uterine cavity varies in thickness from half a line at the fundus (or less in the vicinity of the cornua) to one-eighth or one-quarter of the entire depth of the wall near the centre of the body. It is so intimately united to the muscular tissue, at least in the body of the organ, that the existence of a distinct mucosa has long been denied by many competent observers. In the cervical cavity, on the contrary, where the mucous membrane is much thicker, its attachment to the muscle is not so firm, a layer of areolar tissue intervening.

On account of the marked difference between the mucosa of the body and that of the cervix, it is desirable that they should be considered separately. That of the body is smooth and velvety, of a grayish or grayish-

¹ Quain's *Anat.* (9th ed.), vol. ii., fig. 610, p. 709.

red color, and an average thickness of one-twenty-fifth of an inch. There is a complete absence of folds or corrugations, except in the immediate vicinity of the tubal orifices, where a few small plicæ may sometimes be distinguished, according to Hening. The cervical mucous membrane, as was previously stated, differs from that of the body in being disposed in prominent folds or ridges. It is less distinctly red¹ in color, and is thicker and firmer to the touch. Allusion has been made to the arrangement of the arbor vitæ uterina or plicæ palmatæ. Guyon states that the longitudinal ridges are not exactly opposed, but that the anterior one fits into a depression in the posterior wall of the cervix, so that its canal is practically obliterated. This is best marked near the os internum, where there is a sharp line of separation between the mucosæ of the cervix and body (Fig. 46). The

FIG. 46.



Interior of the Cervix, showing the arborescent appearance of the mucous membrane (Playfair).

arborescent appearance of the cervical lining membrane is best observed in a virgin uterus; after parturition it becomes less distinct.

B. *Minute*.—In a section including the entire thickness of the uterine wall there are presented for study several distinct varieties of tissues. It is well to caution the inexperienced reader that many of the familiar drawings representing the histological structure of the uterus are largely diagrammatic, having been constructed by the comparison of a number of different sections. It is extremely difficult to obtain perfect sections

¹ Yellowish-red, according to most writers.

of the mucous membrane, since this structure is very delicate and soon becomes disorganized. The writer has always placed more confidence in the examination of fresh scrapings from the interior of the uterus than in the specimens obtained from frozen or hardened organs. The peritoneal covering of the organ, like other serous membranes, is most intelligently studied by staining it in the fresh state.

Proceeding from without inward, the following tissues are presented for consideration: (1) A delicate serous layer; (2) a dense mass of fibro-muscular tissue, in which are three different varieties of fibres, blood-vessels, and lymphatics, and finally numerous nerve-filaments; (3) a mucous layer, the structure of which differs in different regions.

(1) The relations of its serous covering to the uterus will be described in the paragraphs on the pelvic peritoneum: it is sufficient to remind the reader that, while this membrane is so intimately united to the muscular tissue over the anterior and upper aspect of the uterus that it can hardly be separated by careful dissection, posteriorly a layer of loose areolar tissue is interposed. When stained with nitrate of silver it presents the ordinary appearance of serous surfaces—*i. e.* a basis of delicate fibrous and elastic tissue supporting large endothelial cells. The capillary and lymphatic plexuses are unusually rich, and may be traced directly into those of the muscular wall; the lymphatic vessels are provided with valves.

(2) The distribution of the muscular substance of the uterus in the form of strata has been described. Under the microscope the longitudinal fibres will be identified by their long fusiform cells arranged in parallel rows. In the centre of each cell is a large oblong nucleus that takes a deeper staining than the surrounding protoplasm. The transverse and oblique fasciculi will be represented by round or oval bodies, cross-sections of the same cells. It is important for the beginner to become perfectly familiar with the appearance of smooth muscular fibres in whatever plane they may be divided, since when stained they are easily mistaken for collections of leucocytes, from the presence of which the incautious observer might infer that some pathological condition was present. It should be remembered that the fibre-cells become hypertrophied during pregnancy, and are a long time in returning to their original size.¹

Among the separate fusiform cells, and between the different groups, there will be seen, in addition to the usual structureless cementing substance, numerous fine connective-tissue fibres: if the latter tissue is treated when fresh with acetic acid, it will be found to contain a considerable number of elastic fibres. These are recognized, in sections stained with carmine or hæmatoxylin, by their failure to retain the dye.

¹ *Vide* Hélie, *op. cit.*; also Kreitzer, *St. Petersb. Med. Zeitschrift*, 1871, Heft ii. p. 113.

In tracing the fibrous tissue from without inward it will be seen that it gradually becomes finer and more condensed, changing its direction from a longitudinal course in the external muscular layer to a circular one in the inner, where it represents at some points the so-called "sub-mucosa" of mucous membranes. In the median layer the fibres interlace in a complicated manner among the muscular bundles, and also accompany the blood-vessels, which they surround in the form of rings: the latter arrangement can be observed in a cross-section of a medium-sized artery.

The middle muscular layer, as before stated, contains a large part of the vessels of the uterus. The arteries, which are readily recognized by their thick walls and convoluted intima, are especially abundant just beneath the mucous membrane, where they form a capillary network. The veins are unusually large and thin-walled, and are without valves. Their walls are closely adherent to the surrounding vessels, so that the latter remain patulous when divided. These veins, which form dense plexuses in each of the three muscular layers, become dilated in the middle layer of the pregnant uterus to form irregular spaces known as "sinuses."¹ Rouget² has described a peculiar mode of communication between the terminations of the arteries and the veins, in which the former are connected with the venous sinuses by means of minute branches, instead of by the usual capillary plexuses.

The lymphatics contained within the muscular substance of the uterus can only be traced by means of special injections. Their extent is best appreciated in pathological preparations, especially in sections of interstitial fibroids that are undergoing the first stage of cyst-formation ("geodes"). In addition to the lymphatic plexus that was mentioned as existing just beneath the serous covering, two varieties of lymphatics may be demonstrated within the muscular substance—a vascular network which accompanies the arteries, and a widespread system of intercommunicating spaces, which not only fill the intermuscular connective tissue, but surround the arteries and veins in the form of perivascular sheaths.³ According to Leopold, these spaces are lined by a single layer of endothelium. The writer has never been so fortunate as to observe this. The lymphatics of the muscular and serous coats (as well as of those of the mucous membrane, to be mentioned subsequently) may be traced to large vessels in the external muscular layer that empty into the efferent trunks at

¹ Klein (*op. cit.*, p. 268) says that the venous sinuses of the middle stratum represent "a sort of cavernous tissue."

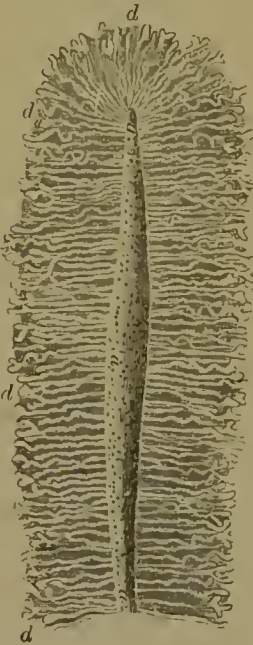
² "Recherches sur les Organes erectile de la Femme," *Journ. de la Phys.*, 1858, p. 320.

³ Comp. Leopold's exhaustive article, "Die Lymphgefäße der normaler nicht Schwangern Uterus," *Arch. f. Gyn.*, Bd. vi. Hft. 1, p. 1.

the lateral borders of the uterus; the latter unite with the lymphatics of the Fallopian tube and ovary and terminate in the lumbar glands.

The minute anatomy of the nerves of the uterus has been most carefully studied by Frankenhäuser. They are derived from the sympathetic system, and their fine filaments may be seen, in fortunate preparations, ramifying among the muscular bundles. According to the above author, they terminate in the nuclei of the fibre-cells.

FIG. 47.



Utricular Glands, as seen in longitudinal section at the period of commencing pregnancy, twice the natural size, showing the arrangement and other peculiarities of the glands, *d, d, d*, with their orifices, *a, a, a*, on the internal surface of the organ.

(3) The mucous lining of the body of the uterus is directly continuous with the internal muscular stratum, the usual submucous layer being wanting. It consists of a loose plexus of connective-tissue fibres, among which may be seen groups of fusiform cells that are derived from the subjacent muscular tissue.¹ In the interstices of the fibres are frequently observed collections of leucocytes: in special preparations these spaces are found to be lined with small endothelial cells, each of which contains an oval flattened nucleus.² From its histological appearance the mucosa has been compared, not inaptly, to the "stroma of lymphoid organs."³ Leopold⁴ calls it "a lymphatic surface which contains no special lymphatic vessels, but consists of lymph-sinuses covered with endothelium." The free surface of the membrane is covered by a single layer of columnar epithelial cells, which are so easily detached that they are seldom seen *in situ* in sections made from hardened specimens. The presence of cilia on the free surface of these cells, although denied by a few observers,⁵ is well established.⁶ The writer has

found them in fresh scrapings of the uterine cavity, removed by means of the eurette, although they were never in motion when seen.

The mucous membrane is filled with glands (*glandulæ uterinæ*) of the tubular variety, which penetrate through its entire thickness, their

¹ Savage (*Female Pelvic Organs*, Wood's ed., p. 45) says that the tissue composing the framework of the mucous membrane "is permeated by protoplasmic amœboid molecules, which by cell-evolution take the place of effete fixed cells, amongst others the gland-cells, which are dying incessantly in the act of giving out their secretion." This is a very plausible theory, but it is doubtful if it rests upon any positive anatomical basis.

² Leopold, quoted by Klein (*op. cit.*, p. 266).

³ Satterthwaite's *Manual of Histology*, p. 243.

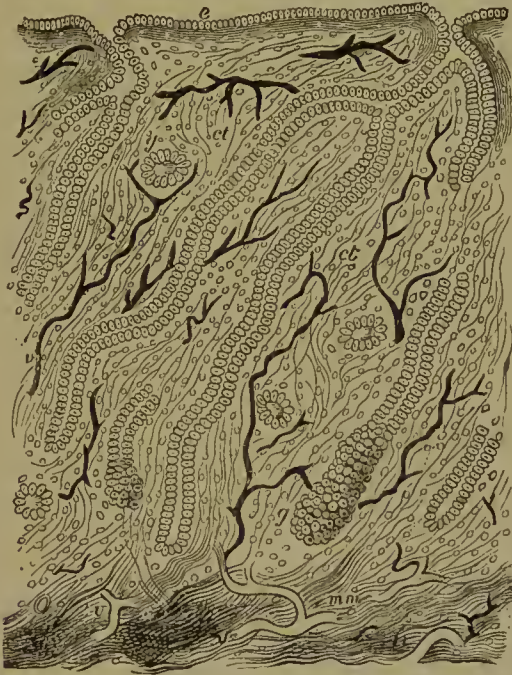
⁴ Garrigues, De Sinéty.

⁵ Stricker, *Die Lehre der Geweben*, Leipzig, 1871, p. 1173.

⁶ *Op. cit.*, p. 31.

culs-de-sac occasionally being imbedded in the inner muscular layer. As Turner has shown, the direction of the glands is not perpendicular to the surface (as Engelmann figures them¹), but is more or less oblique.² They may exist as single tubes, sinuous or spiral, but more often they divide into two or three branches near their lower ends, where they become somewhat dilated. In longitudinal section they present a delicate basement membrane, which, according to Leopold, is "composed of spindle-shaped cells, which dovetail into one another like the endothelium of the capillaries and lymphatics."³ The existence of this

FIG. 48.



Vertical Section through the Uterine Mucous Membrane (Turner): *e*, columnar epithelium; *g*, *g*, utricular glands; *ct*, connective tissue surrounding glands; *v*, *v*, blood-vessels; *mm*, submucous layer.

membrana propria in the unimpregnated uterus is denied by some authorities; others state that it is only found near the orifice of the gland. It is well marked in the pregnant uterus. Upon this membrane rests a single layer of prismatic cells, with single large nuclei near their bases. It is now generally allowed that these cells are ciliated.⁴ The uterine glands increase largely in number at puberty,

¹ *Am. Journ. of Obstetrics*, vol. viii. p. 40.

² Ranney, *Annals of Anat. and Surgery*, April, 1883. contra.

³ Leopold, quoted by Lusk (*op. cit.*, p. 17). See also Ercolani, *Utricular Glands of the Uterus*, trans. by Marcy.

⁴ Comp. Chrobak in Stricker's *Handbuch*; Nylander (*Müller's Archiv*, 1852, p. 375); Lott (*Rollett's Untersuch.*, Leipzig, 1871); Williams (*Structure of the Mucous Membrane of the Uterus*); Friedländer (*Untersuch. über d. Uterus*, 1870).

being formed by a simple folding-in of the general mucous surface: during menstruation there is a perceptible increase in their length, which becomes much more evident during pregnancy.

The mucous membrane possesses its own vessels and nerves. The glands are surrounded with rich capillary networks, which communicate with the plexuses in the muscular tissue; the lymph-spaces are directly connected with the lymph-sinuses and vessels in the inner layer. The ultimate ending of the nerves in the mucous membrane is not certain. Some of them enter small ganglia; others form plexuses of non-medullated fibres, the primitive fibrils of which are seen immediately below (or within?) the epithelial cells.¹

The principal differences between the minute anatomy of the cervix and that of the body of the uterus lie in the structure of the mucous membrane. There is no serous investment to the cervix. Its infravaginal portion is covered externally by vaginal mucous membrane, the appearance of which under the microscope has already been described. A section through the muscular substance of the cervix shows a preponderance of firm connective tissue as compared with that in the body of the organ. The muscular interlacement is so intricate that a separation into layers is not possible. "In the cervix," says Savage, "the uterus at once loses the characters of an erectile organ"—by which statement he evidently refers to the firmer condition of the cervical tissue and the absence of the large venous sinuses. The blood-vessels of the cervix differ from those of the body in possessing small lumina with extremely thick walls,² the thickness being most marked in the circular layer of muscular fibres. Within the tissue of the labia the small arteries and veins run in parallel rows to and from the mucous membrane: this disposition is also apparent in the arbor vitæ, where the vessels run at right angles to the free surface.

The mucous lining to the cervical cavity is considerably thicker than that of the body. In a cross-section it will be noted that there is a layer of connective tissue separating the epithelium from the muscular coat. The parallel rows of vessels just alluded to form capillary plexuses beneath the epithelial layer. The papillæ that have been described by so many writers, and in which the capillaries have been said to form loops,³ are in reality appearances presented in sections that have been made through the plicæ palmatæ.⁴ The latter are due simply to increase in the connective-tissue framework.

The basis of the cervical mucosa is a firm, fibrous, and not a lymphoid, tissue, upon which rests a layer of ciliated cylindrical epithelial

¹ Lindgren, quoted by Klein (*op. cit.*, p. 268).

² According to Henle (*Handbuch der Eingeweidelehre*), the diameter of the lumen averages only one-third of that of the entire vessel.

³ Lusk, quoting from Henle (*op. cit.*, p. 25).

⁴ Klein (*op. cit.*, p. 266).

cells. According to some authorities, the cilia are present universally over the upper two-thirds of the cervical canal;¹ the most recent investigations, however (especially those of De Sinéty²), have established the fact that ciliated epithelium exists throughout the entire cavity, but only upon the summit of the ridges, the cells covering the depressions being non-ciliated.³ The glandular structures of the membrane are of the racemose variety, consisting of branching ducts with dilated ends. These are surrounded by capillary plexuses, and consist histologically of simple inversions of the mucous membrane. They are lined by a single layer of non-ciliated⁴ cubical epithelium, which is supported by a structureless basement membrane. These glands open upon the free surface by minute apertures that are both upon the ridges of the plicæ and in the depressions between them. They secrete a clear mucus having an alkaline reaction. The well-known ovula Nabothi are pathological appearances due to the occlusion of the follicles and the formation of simple retention-cysts.

In sections of the cervix at the level of the os externum a well-marked line of separation will be observed between the ciliated columnar epithelium of the canal and the vasculæ papillæ and squamous epithelium derived from the reflexion of the vaginal mucous membrane. The latter have been previously described. There has been much discussion as to the presence or absence of glands on the vaginal surface of the normal cervix. It would not be profitable to enlarge upon this topic here. The writer's observations have led him to believe that De Sinéty and Ruge and Veit are correct in denying their existence, except under pathological conditions.⁵

VESSELS AND NERVES.—The uterine artery is a most important vessel surgically. It arises from the anterior division of the internal iliac, and takes a course downward and inward between the folds of the broad ligament, until it arrives at a point below the level of the os externum, just above the lateral fornix of the vagina. Here it makes a sharp turn upward, and runs along the lateral border of the uterus to unite at about the centre of the organ with the descending branch of the ovarian artery. It gives off numerous horizontal branches, which run in spirals (hence their name, "curling arteries of the uterus") and supply the various segments of the organ, anastomosing with the corresponding branches of the opposite vessel. A branch of considerable size opposite to the os internum unites with its fellow to form a ring

¹ The lower limit is stated by some as within one-sixth of an inch from the os externum.

² Also Klein, *op. cit.*, p. 266.

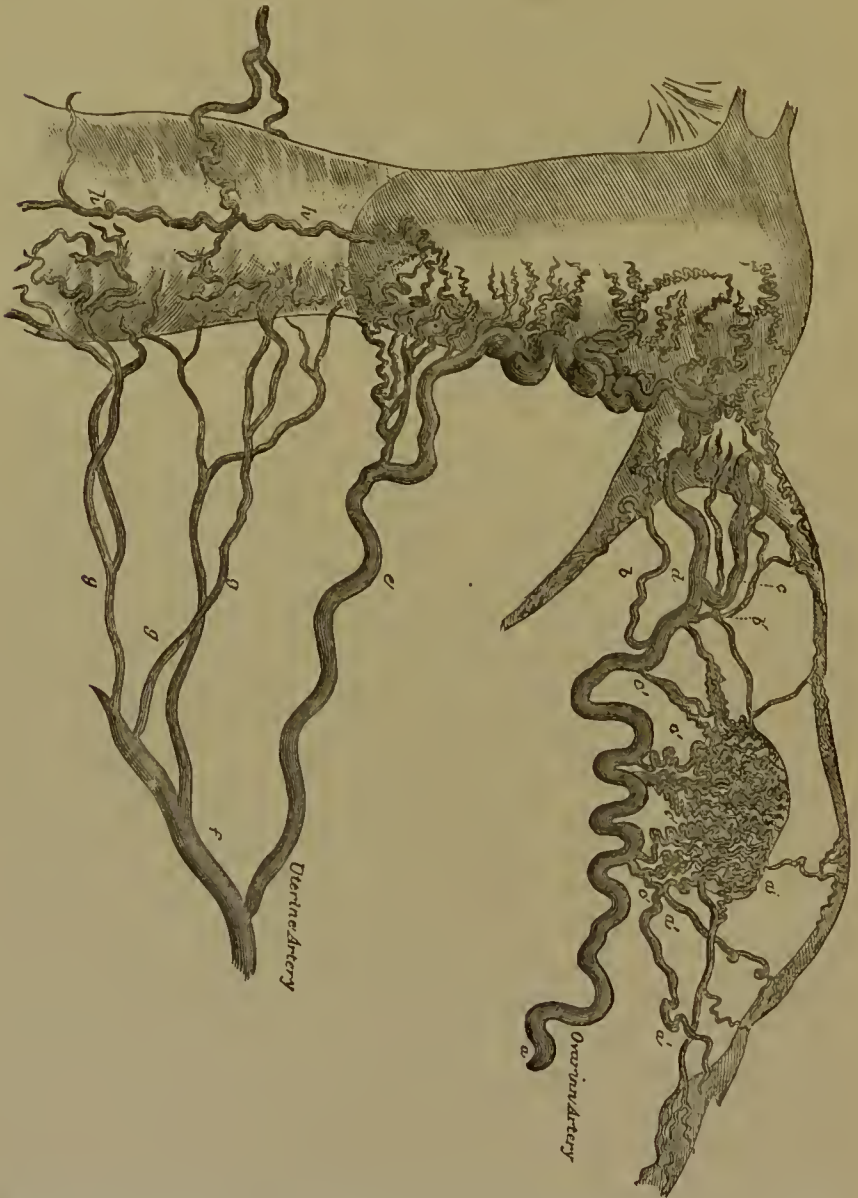
³ In children, according to Lott (*Zur Anat. u. Phys. der Cervix Uteri*, p. 17), the epithelium in the upper half of the cervix is not ciliated.

⁴ The gland-cells are probably ciliated in the newborn, but not after puberty.

⁵ See Ruge and Veit, *Zur Pathologie der Vaginalportion*, Stuttgart, 1878.

around the cervix, known as "the circular artery." This vessel is frequently found at a lower level. Other branches run over the fornix vaginae, anastomosing with offsets of the vaginal artery. The latter

FIG. 49.



The Ovarian, Uterine, and Vaginal Arteries (Hyt1): *a*, ovarian artery; *a'* and *b'*, branches to tube; *b*, branch to round ligament; *c*, uterine artery; *c'*, branches to ovary; *g*, vaginal artery; *h*, azygos artery of vagina.

vessel may arise directly from the uterine. Williams has called particular attention to the fact that each horizontal segment of the uterus has to some extent an independent vascular supply, so that flexions of

the organ cannot result in any general obstruction to the blood-flow. The fundus receives additional branches from the ovarian arteries.

The uterus is completely surrounded by intricate venous plexuses

FIG. 50.



The Nerves of the Uterus (Frankenhäuser): *A*, plexus uterinus magnus; *B*, plexus hypogastricus; 1, sacrum; 2, rectum; 3, bladder; 4, uterus; 5, ovary; 6, fimbriated extremity of tube.

(that lie beneath the peritoneum), which receive the blood from the veins and sinuses within the walls of the organ. These plexuses communicate freely with the vaginal and vesical plexuses below, and with the pampiniform above, and terminate directly in the internal iliac vein, indirectly in the ovarian. The "utero-vaginal" plexus, as figured by Savage, surrounds the lower part of the uterus and the vaginal fornix. The ureters run directly through this mass of veins to reach the bladder.

The lymphatics coming from the body of the uterus unite on each

side with those from the ovary and tube, and form a dense network within the broad ligament around the pampiniform plexus, the efferent branches of which ascend in company with the ovarian artery and terminate in the lumbar glands. The lymphatics from the cervix and upper extremity of the vagina form a plexus at the level of the os internum, and descend on each side to the base of the broad ligament, beneath which they pass to enter the hypogastric glands around the iliac vessels: here they are joined by the vesical lymphatics.¹

The main nerve-supply of the uterus is derived from the pelvic or inferior hypogastric plexuses, which surround the rectum and send filaments to the uterus and vagina. These are prolongations of the uterine plexus that lies over the bifurcation of the aorta. The uterine branches spring from the sides of the pelvic plexuses, run inward between the folds of the broad ligaments until they reach the cervix, when they turn upward, accompanying the branches of the uterine artery and entering the substance of the organ with them. A large nervous mass, situated between the cervix and rectum, arises from the

FIG. 51.



Transverse Section of the Body, showing relations of fundus uteri (Savage): *M*, pubes; *A, A*, hypogastric arteries in front, spermatic vessels and nerves behind; *B*, bladder; *L, L*, round ligaments; *U*, fundus uteri; *T, T*, Fallopian tubes; *O, O*, ovaries; *R*, rectum; *G*, right ureter; *C*, utero-sacral ligaments; *V*, last lumbar vertebra.

union of branches of the upper sacral nerves and ganglia, and a number of sympathetic twigs from the hypogastric plexus: it supplies the cervix chiefly, and is enormously enlarged during pregnancy.

The ultimate termination of the uterine nerves is either in the nuclei of the fibre-cells or in submucous ganglia.²

¹ Le Bec ("Contributions à l'Étude des Ligaments larges," *Gaz. heb.*, Apr. 15, 1881) says that they terminate in the obturator gland.

² Frankenhäuser, *Die Nerven der Gebärmutter*, etc., Jena, 1867.

RELATIONS AND CONNECTIONS.—These have already been mentioned, or will be in the course of the succeeding pages. For convenience they may be briefly repeated. As has been stated, when the bladder and rectum are empty the uterus lies normally in a position of slight ante flexion. At some distance below the fundus uteri, and separated from it by a double fold of peritoneum and a quantity of cellular tissue (below the vesico-uterine pouch), is the fundus of the bladder. The writer cannot accept the statement that the fundus rests upon the bladder, as figured by Schultze, Pirogoff, and others. Behind the uterus is Douglas's pouch, which separates the posterior aspect of the organ from the rectum. When the bladder is empty, coils of small intestine fill the upper part of this pouch and rest against the fundus and posterior aspect of the uterus. Laterally are the broad ligaments, in the upper edges of which are the Fallopian tubes, while below their proximal extremities are the origins of the ovarian and round ligaments. Below is the vault of the vagina, which surrounds and is firmly attached to the uterus. Just above the line of attachment (utero-vaginal) is the portion of the supravaginal segment of the cervix which lies in the subperitoneal space and is surrounded by areolar tissue containing venous plexuses. The relations of the pelvic peritoneum and connective tissue to the uterus will be described under the subdivisions which treat of those subjects. The so-called false and true ligaments of the uterus (except the round ligaments) will be included under the same topics.

PRACTICAL DEDUCTIONS.—Allusion has been made to the range of mobility of the uterus in an antero-posterior plane. It is important that the physician should learn to recognize not only the physiological changes of position produced by a full rectum or bladder, but those caused by posture. For example, if an old multipara is examined upon the back, the uterus, by reason of the weight of the organ and the relaxation of its ligaments, may be felt through the posterior fornix; with the patient semi-prone the uterus falls forward, and the fundus is distinctly touched through the anterior fornix. Two different examiners may thus diagnosticate ante- and retroversion in the same patient.

The normal uterus may be elevated on the finger to the extent of between one and two inches without doing injury to the surrounding parts.¹ The reader should be cautioned against accepting unhesitatingly the statement that "artificial prolapsus" is an entirely harmless procedure. Experiments made upon the cadaver are not conclusive; the inexperienced will act wisely in distrusting the teaching that the uterus

¹ A clear idea of the mobility of the uterus in a vertical direction can be gained by observing (during an examination with the speculum) the manner in which the respiratory movements are transmitted to the organ. This is still more marked in singing, defecation, etc.

"can be drawn downward by the volsella to the ostium vaginae without endangering its return to its proper position in the pelvis" (Ranney). Practical gynecologists are apt to be cautious in resorting to such aids to diagnosis. As our knowledge of the frequency of tubal disease and localized peritonitis becomes more certain, we hesitate about exerting much traction upon the appendages by dragging down the uterus in the manner described. It is necessary to be on one's guard during operations or examinations under ether, because when the parts are thoroughly relaxed by an anæsthetic a uterus which previously possessed a limited range of mobility can be pushed upward or depressed to an extent which did not seem possible. Not having the patient's expressions of pain as an index, we may easily rupture recent peritonitic adhesions and do incalculable harm without being aware of it. The cardinal principle in gynecology should be not to do the woman any harm: the question of actually benefiting her is often of secondary importance. The reader will avoid one, by no means imaginary, source of danger if he learns to make a diagnosis and to practise the ordinary operations while displacing the uterus just as little as possible, either with or without instruments.

While we become familiar with the normal mobility of the uterus, we should be equally prompt to recognize impairment of the same, either partial or complete: moreover, if this information can be gained without the use of the sound, so much the better. The diagnosis of retroflexion with fixation will be discussed elsewhere.

Ascension of the uterus—a normal condition in pregnancy—should be viewed with suspicion when the organ is not thus enlarged, since it points to the probable presence of adhesions or morbid growths. Note that it does not follow that the organ is thus displaced because the examiner finds it difficult to reach the cervix: the vagina may be unusually long, or the cervix short. By examining the patient upon the side the mechanical difficulty may be overcome. The extent to which the uterus can be elevated is best appreciated during the performance of Alexander's operation: the limit is found to depend upon the mobility of the organ, but upon the length of cord which can be drawn through the inguinal ring. The operator can hardly raise the uterus too high.

As the uterus is capable of motion laterally as well as antero-posteriorly, so it may be fixed in a position of lateroflexion by cicatrices in either broad ligament—a displacement which it is particularly difficult to correct by means of tampons.

Lateral deviation of the multiparous uterus is frequently observed when the patient is in Sims's position; the normal mobility in this direction is limited, but distinct. Lateroflexion, with fixation, it is hardly necessary to add, is a more serious displacement, pointing to a

former inflammation in one of the broad ligaments in which the corresponding ovary and tube are doubtless involved; it should lead the surgeon to be on his guard against any rough manipulations.

The changes in position consequent upon the increasing size of the organ (pregnancy, subinvolution) are self-evident: the tendency to prolapsus observed in old subjects is often explained by general atrophy and loss of tone in its supports, the organ itself being really of small size. It is only necessary to allude to the physiological changes in the shape and size of the uterus. It is not always an easy matter to recognize these by bimanual palpation or to assign them to their proper cause. The diagnosis of early pregnancy from the shape and consistence of the organ, as suggested by Hegar, deserves the careful consideration of every gynecologist. He relies upon the presence of softening and thinning of the inferior segment of the uterus, as well as the pyramidal shape assumed by the body.¹ There is a peculiar bulging of the anterior wall and an elasticity of the fundus, as felt through the anterior fornix, which may be recognized as early as the fifth or sixth week of pregnancy, even when the cervix does not show any marked changes.

The anatomy of the cervix uteri and its surroundings should be carefully studied by the gynecologist. He who forms his conception of its appearance entirely from descriptions of the nulliparous cervix will be sadly puzzled when he comes to touch, or to observe through the speculum, the results of an extensive laceration. It is necessary for one to examine a large number of multiparæ before he can be in a position to appreciate the fact that no two cervices are alike. To the various changes in shape, size, etc. to which this portion of the uterus is subject as the result of pathological conditions (especially laceration) we need not refer, since these are touched upon elsewhere; the effect of pregnancy upon the size and consistence of the part is described in works on obstetrics. It was stated that Schroeder's division of the cervix into three distinct zones is more or less artificial; the "portio intermedia" is often wanting in multiparæ. In old subjects the cervix is represented by a small nodule projecting from the vaginal roof. In cases of extensive bilateral laceration with eversion it appears to be flush with the roof, until the opposite lips are approximated, according to Emmet's direction, by means of tenacula.

The long axis of the uterus forms such an angle with that of the vagina that the reader must not be surprised at times to find the cervix high up against the posterior fornix, with the os externum resting against the rectum: this position is of course modified as the rectum and bladder become distended. When the vagina is unusually deep and the cervix long, it may be impossible for a tyro to either touch the os or to bring it into view with the speculum. By applying the prin-

¹ Comp. *Prager Med. Wochenschrift*, No. 26, 1884; *Annales de Gynécologie*, Sept., 1884.

ciple already stated, he will succeed in exposing it by slipping the longest blade of the instrument behind the cervix and gently prying the latter forward, while with the depressor he exerts traction upon it by making pressure in the anterior fornix. The introduction of a retroversion pessary may be rendered difficult by the same condition of the parts. In inserting such an instrument the upper bar has a tendency to slip in front of the cervix and to glide into the anterior cul-de-sac: when this occurs the beginner should remove the pessary and repeat the manœuvre, instead of trying to carry the bar backward over the cervix into position. The same rule should be followed as in introducing the speculum—*i. e.* to hug the rectal wall closely until the tip of the cervix is passed.

A few brief practical points may be mentioned in connection with operations on the cervix, suggested by its structure and relations. The height of the vaginal attachment varies; the posterior wall of the vagina meets the cervix at a point above the junction of the anterior. It is evident that a laceration of the cervix through the vaginal junction must be an extensive one, and liable to be followed by parametritis and subsequent cicatrization. Amputation of an hypertrophied cervix may be compared with circumcision; if the uterus is drawn down and due provision is not made for the retraction of the vaginal tissue, nearly the entire fornix may be excised, leaving an unsightly wound. In high amputation for cancer, if firm traction is made on the uterus while the vaginal attachment is separated, the os internum will be opposite to the line of incision, so that it will only be necessary to divide the cervix straight across. If the disease has invaded the body of the organ, it is easy to remove a wedge-shaped piece; when the parts are allowed to retract, the operator is frequently surprised at the depth of the excavation.

The intimate relation of the cervix to the broad ligaments, with their labyrinth of blood-vessels and lymphatics, renders it easy for us to understand the reason why lacerations may be followed by inflammatory processes. The frequency of so-called cellulitis has been questioned, but the occurrence of inflammation in the tissues adjacent to a lacerated cervix as the result of septic abortion (whether we term it lymphangitis, periphlebitis, or cellulitis) can certainly not be denied *in toto*.¹ At the same time, the direct continuity of the cervical and corporeal endometrium points to a certain source of tubal and peritoneal trouble originating in lesions of the cervix. In all of the autopsies performed by the writer in fatal cases of hysterotrachelorrhaphy and posterior section (five or six) death was due to an extension of inflammation from the wound *upward* along the mucous membrane, *not out-*

¹ Comp. paper by the writer in *Trans. of Alumni Association of the Woman's Hospital*, vol. i. p. 67.

ward along the broad ligaments. Recalling the anatomy of the uterosacral ligaments, it is not always easy to understand how parametritis posterior can be a frequent accompaniment of cervical lesions.

That incision of the cervix for stenosis is not an entirely harmless procedure is evident anatomically as well as clinically. The proximity of the peritoneum and the rich network of veins which lie in the muscular coat of the uterus render the danger of peritonitis and septic absorption no imaginary one. The indications are clearly to make the incision as limited in length and depth as possible, and to practise rigid antisepsis.

The corpus uteri is only indirectly accessible through the medium of the bimanual touch; in fat subjects it is frequently impossible to feel it at all. Extreme deviations from its normal size and position are easily recognized by the most inexperienced, but to detect moderate enlargements, small fibroids in the anterior or posterior wall, unusual softness of the muscular tissue, etc., requires long practice and a thorough familiarity with the feel of the normal organ. It is a matter of daily experience among laparotomists to find on opening the abdomen that the size and position of the uterus do not correspond to the impressions derived at the examining-table. The fundus, as touched through the fornix, usually appears larger than it really is, the normal protrusion of the anterior surface being often mistaken for an interstitial fibroid. Some gynecologists diagnose anteversion whenever they feel the fundus uteri through the anterior fornix, while others rarely make this diagnosis. If the reader will bear in mind the range of mobility of the organ, he will doubtless meet with fewer displacements. As regards the difference between anteversion and anteversion, the reader should remember that there is normally a distinct, though large, angle between the cervix and the body, which is increased when the uterus is enlarged and of softer consistence than usual.

It does not belong to this place to enter at length into a consideration of the variations in the shape and size of the corpus uteri. The possibility of an enlargement being due to pregnancy should always be kept in view, even when there are no symptoms pointing to that condition, especially when an operation is meditated. In the absence of this condition, it will remain to determine whether the enlargement is general, and is caused either by some growth in the intra-uterine cavity or by a hypertrophy of the muscular substance, or is of an irregular character, due to growths on its exterior. The normal changes in old age—atrophy, decrease in depth, etc.—must not be mistaken for disease.

Variations in the consistency of the uterine wall are not easily recognized unless marked. The normal fundus has a firm, elastic feel as touched through the fornix; it is claimed that the peculiar softness of the pregnant organ can be recognized as early as the sixth week. In

subinvolution, in malignant disease of the body, etc., the tissue is softened. The recognition of this condition of the muscle should lead the surgeon to be cautious in using the sound, sharp curette, spoon-saw, and other similar instruments, since he might easily perforate the uterine wall.

There are many points in regard to the anatomy of the uterus, both gross and microscopic, which are of direct surgical interest. The depth of the cavity in the unimpregnated organ is usually given as two and a half inches, but it frequently exceeds this measurement in the living female by reason of the elasticity of the wall. Most of the cases in which a probe is supposed to enter one of the Fallopian tubes, because it can be introduced to the depth of four or five inches, should be viewed with suspicion. The cavity in such instances is doubtless really elongated; sometimes the wall itself is perforated without serious consequences, as in a case observed by the writer. It is important for the physician to become thoroughly familiar with the depth, direction, and size of the normal cavity as indicated by the probe or sound, as well as with the peculiar spongy, elastic sensation communicated through the instrument as it touches the fundal mucous membrane, before he can expect to recognize deviations from the normal at the examining-table or undertake manipulations within the cavity. These are matters not of *description*, but of *practice*. Beginners invariably forget that the uterine canal forms a decided curve, and that any instrument designed to enter it must either have a corresponding curve, or in introducing it its handle must be carried well backward to a line parallel with the uterine axis; this applies particularly to tents. A glance at a median section of the pelvis will show that to endeavor to push a tent straight upward in the axis of the os externum is to lose sight of the first principles of common sense, still more those of anatomy; in fact, the writer has known of the posterior uterine wall being perforated in this way. The cavity of the nulliparous uterus appears in a vertical section as little more than a slit; even in the interior of the multiparous organ that has undergone subinvolution there is scanty room for manipulation with instruments. Consequently, in using the curette we are limited mainly to a scraping motion in a vertical direction. Considering the large arc described with the handle of a sharp curette or spoon-saw, as compared with the small space in which the blade revolves, it is evident that some care must be exercised in sweeping the latter about in a circular direction.

The normal constriction at the os internum is often mistaken for a pathological condition. The existence of an angle at this point is to be remembered in introducing the sound, which is often arrested at this point when it is not properly curved; a temporary constriction is frequently caused by a contraction of the sphincter muscle. An internal

os which barely admits of the passage of a probe will easily allow the introduction of a large sound when the patient is anesthetized. Another practical hint derived from the angle between the cervix and body is this: If an instrument or tent is arrested at the os internum, draw the cervix downward and backward with a tenaculum, thus rendering the canal more nearly straight.

Our opportunities for studying the normal lining membrane of the uterus are few, endoscopy not having achieved many satisfactory results in this direction. In cases of deep laceration of the cervix with marked eversion the mucous membrane is visible nearly as high up as the os internum, but its angry, florid appearance is far from being that of health. It is a mistake to suppose that the lining of the corporeal cavity has normally a soft, spongy feel; it is rather elastic. The rugæ in the cervical canal often render the introduction of a probe difficult when a sound will not be arrested. The normal endometrium being poorly supplied with sentient nerves, no pain should be experienced in the passage of an instrument. Extreme sensitiveness is proof positive of the existence of disease. The uterine wall is of considerable interest surgically. In the non-parous organ, when removed from the body, it appears to be semi-cartilaginous and almost non-vascular, yet few structures bleed more obstinately when wounded. From the thickness of the wall, as seen in mesial section, as well as from its inherent toughness, it would seem as if a blunt instrument could not be forced through it except by the exercise of great violence; but when it is softened by pregnancy or disease (subinvolution, carcinoma) the accident might easily occur.

Divulsion of the cervix—a procedure which is frequently practised at the present day to the exclusion of the cutting operation—owes its success to the complete stretching, or even tearing, of the fibres of the sphincter muscle. Unless this is thoroughly effected, the benefit will only be temporary. In incision of the cervix the surgeon aims rather at straightening, than at enlarging, the canal. The idea that a flexion can be permanently eliminated by the use of an intra-uterine stem is hardly founded on anatomical principles.

Some idea of the extreme vascularity of the wall will be gained during operations which involve direct injury to it, as in the enucleation of interstitial fibroids, myotomy by Schroeder's method, etc.; fortunately, the contractility of the muscular substance is sufficient to overcome to some extent the tendency to bleeding. Hemorrhage from the external muscular layer is difficult to control; the peritoneal covering of the uterus is sometimes torn while separating adherent ovarian tumors, when the venous oozing is almost uncontrollable. Styptics, the actual cautery, etc. are often useless, and it is impossible to surround the bleeding points with ligatures. During an ovariectomy the writer was obliged

to seize the bleeding surfaces *en masse* with two pairs of long forceps, and to leave these in the abdomen for forty-eight hours. In the intra-peritoneal method of treating the stump after hysterectomy it is important to secure all of the vessels on its surface, otherwise a dangerous oozing may occur beneath the peritoneal flaps.

Although the peritoneal covering of the uterus is no longer regarded as inviolable, and subserous fibroids are now removed with impunity, it should not be forgotten that this covering belongs to the general peritoneal lining of the pelvis, in which inflammation extends rapidly. The close proximity of coils of small intestine to the uterus favors the formation of adhesions between their serous surfaces in peritonitis. If the patient recovers with permanent adhesions, she will be subject to distressing symptoms referable both to the uterus and the imprisoned gut. Doubtless this complication would be less frequent if the bowels were moved earlier in the course of the disease, instead of being paralyzed with opium.

The minute anatomy of the uterus does not concern the surgeon so much as it does the pathologist. A study of its vast network of veins and lymphatics, and their connection with the mucous membrane, cannot fail to suggest some practical lessons in regard to the strict use of antiseptics in all operations within the cavity. Although this article does not deal with obstetrics, the writer cannot avoid the temptation to reiterate the trite maxim that an intelligent appreciation of the absorbent power of the uterine vessels would lead accoucheurs to view with apprehension the smallest puerperal lesion, and by their careful use of antiseptics to render subsequent attention on the part of the gynecologist unnecessary. The normal histology of the cervix possesses no small degree of practical interest. Attention has been called to the transition from the columnar epithelium lining the cervical canal to the squamous variety that covers the portio vaginalis beyond the os externum. The importance of this distinction becomes evident in studying the pathology of cervical ectropium resulting from laceration. This subject is discussed elsewhere. We can only emphasize here the fact that "ulceration" of the cervix does not exist—that the raw everted surface seen in these cases is really "*a newly-formed glandular secreting surface* resembling in structure the cervical mucous membrane."¹ The importance of the cervical glands in this connection, as well as in relation to the development of epithelioma, cannot be over-estimated. The cervix during pregnancy has been called by Fritsch a "glandular organ," and the pathological hypertrophy of the glands both explains the causation of cervical catarrh and furnishes a hint for its successful treatment. The glands, being the seat of the disease, must be thoroughly destroyed by means of strong caustics, thorough scraping with

¹ Hart and Barbour, *op. cit.*, p. 279.

the sharp curette, or even by complete excision of the mucous membrane according to Schroeder's method.

The cervix is composed essentially of connective tissue, which is normally tough and resistant; in old age it may assume a semi-cartilaginous consistence. It is anatomically and clinically one of the least sensitive portions of the genital tract; operations have frequently been performed upon it without the use of an anæsthetic, the patient experiencing comparatively little pain. For this reason it is difficult to estimate to what extent cocaine acts as a local anæsthetic in hysterotrachelorrhaphy.

This portion of the uterus is not particularly rich in nerve-filaments, nor does it abound in those terminal bulbs that are found in the external genitals. The explanation of various reflex neuroses in cases of lacerated cervix by reference to the inclusion of nerve-filaments within the "cicatricial plug" at the angle of the tear does not, therefore, rest on a positive anatomical basis.

There is no time to study the anatomy of the uterus with reference to the origin of morbid growths from its tissues. This opens up an interesting subject which has been fully treated by Gusserow.¹

Some familiarity with the distribution of the uterine vessels is indispensable for one who aspires to a scientific knowledge of gynecology. Probably not one medical student out of twenty ever takes the trouble to inject and dissect them out in the cadaver; fortunately, a study of plates and museum-specimens will enable him to supply his deficient practical knowledge to some extent. Writers on pelvic pathology have unfortunately shown a disposition to distort anatomical facts to suit their individual theories. If the reader will glance at any plate showing the pelvic circulation (Hyrtl's, for example), he will recognize the justness of Dr. Williams's criticism of the theory that uterine "engorgement" is a necessary result of displacements, especially flexions. The uterine artery gives off a large number of parallel branches which run at right angles to the main trunk, and anastomose freely with the corresponding branches on the opposite side, so that the uterus may be regarded as composed of numerous segments, each of which has its independent vascular supply. It is obvious, without argument, that no flexion, however sharp, can cause any considerable interruption of the circulation either above or below the point of flexion. The same principle may be extended to supposed obstructions in the periuterine tissues from localized inflammatory foci (peri- or parametritis); the pelvic vessels anastomose too freely to admit of an unquestioned acceptance of the theory of general obstruction and engorgement.

The uterine vessels are of importance principally from a surgical

¹ *Neubildungen des Uterus.*

standpoint. In vaginal extirpation of the uterus it is important to control the vessels in the broad ligaments before separating the uterine attachments. Some difficulty may be experienced in passing a ligature around the ovarian artery from below. A recent writer has suggested that the operation might be shortened by compressing each broad ligament, with its contained vessels, with a pair of long forceps, detaching the uteri, and afterward securing the vessels at leisure. There is some danger in this method that one or more of them may slip, when it will be a difficult matter to pick them up again. The defect in the plan of starving a malignant growth of the uterus by cutting off a portion of the blood-supply of the organ, or of preventing the hemorrhage in sub-peritoneal myomectomy by ligating one or two of the arteries, will be evident from what has already been said of the free anastomosis of the pelvic vessels. It should be noted that the uterine artery runs near the base of the broad ligament, so that its pulsation can often be felt through the lateral fornix. Some of its large vaginal branches may be divided in the incision for gastro-elytrotomy. The circular artery of the cervix, formed by the union of opposite branches from the main trunks, is a bugbear that is constantly held up before the inexperienced operator. The fact is, this vessel, which lies opposite to the cervix, is rarely divided in Emmet's operation, and when it is the hemorrhage can be readily controlled by passing a wire suture beneath it and twisting the same. In cases of extensive laceration in which the denudation is carried deep into the angles a small arterial branch is often cut, but the hemorrhage is by no means as alarming as we have been taught to expect.

It should be noted that in certain morbid conditions of the uterus (especially fibro-cystic disease) the vessels are enormously enlarged, so that a venous hemorrhage would be fatal in a short time.

Our knowledge of the functional nervous affections of the pelvic organs is as fragmentary as the study of their nerve-distribution is difficult. Pain as a subjective symptom of pelvic disease is seldom localized in any single organ: the relation between the plexuses is too intimate to admit of the application to them of Hilton's ingenious theories. Doubtless, many supposed ovarian pains are really due to disease of the uterus, and *vice versa*. When we advance a step farther and consider the relation of the uterine nerves to those of the general sympathetic system, and the various reflex disturbances which result from this intercommunication, we begin to deal with psychical phenomena which have little to do with the sober facts of pelvic anatomy.

We cannot conclude these rambling remarks on uterine surgery more fitly than by quoting from a writer of the old school, whose caution is too often disregarded by the modern gynecologist: "No surgical proceeding whatever, touching any part of the uterine system, should be

unattended by the precautions observed in operations of a grave character there or elsewhere: in certain states of the general system, unfore-shadowed by any recognizable peculiarity, the most trivial operation has been speedily followed by fatal peritonitis.”¹

The round ligaments are properly described in connection with the uterus, since they are really outgrowths from the superficial muscular layer.

ROUND LIGAMENTS.

SYNONYMS.—Suspensory ligaments; *Lat.*, ligamenta rotunda, ligamenta tereta uteri; *Fr.*, ligaments ronds de la matrice; *Ger.*, runde Mutterbänder; *It.*, legamenti rotonde; *Sp.*, ligamentos redondos.

DEFINITION.—The round ligaments are two fibro-muscular cords which spring from the superior angles of the uterus, extend forward and outward to the internal inguinal ring, and pass through the inguinal canal to reach the anterior aspect of the symphysis pubis, where they terminate in fibrous expansions which are lost in the substance of the mons Veneris.

These structures, the anatomy of which is commonly dismissed in a few words, deserve a careful description, because of the importance that they have recently assumed in connection with Alexander's operation.

Each ligament appears as a somewhat flattened cord, which remains of quite constant size in the same subject (and, in fact, in different subjects) until after it has entered the inguinal canal, when it tapers gradually, and at its point of exit varies greatly in size and distinctness. Its length varies from four to five inches.²

For convenience of description, the ligament may be divided into three portions—that part which lies within the pelvic cavity, that within the inguinal canal, and the terminal portion. The pelvic division of the ligament is attached to the anterior aspect of the upper angle of the uterus, in front of, and immediately below, the origin of the Fallopian tube. Lying at first in the anterior fold of the broad ligament, it curves upward and outward, then forward and inward, to reach the internal ring. In the latter part of its course it leaves the broad ligament, and, enveloped in a fold of peritoneum, runs near the lateral wall of the pelvis, lying well to the outer side of the bladder even when that organ is distended; it crosses the external iliac and obliterated hypogastric arteries, and at the internal ring has the same relations as the spermatic cord in the male, the epigastric artery curving around it on its inner side. At its origin the ligament is large

¹ Savage, *op cit.*, p. 92.

² Madame Boivin has stated that the right ligament is slightly shorter and thicker than the left.

and fleshy, and has a somewhat triangular shape on cross-section; before leaving the broad ligament it becomes smaller and more cylindrical. Within the inguinal canal (the length of which is one and a half inches) it is nearly round, and tapers gradually toward the external ring. Its relations within the canal are identical with those of the spermatic cord. The fold of peritoneum that envelops the intrapelvic portion of the ligament forms a slight depression at the internal ring, but does not usually extend beyond this point in the adult, although in the fœtus after the fifth month it regularly accompanies the ligament throughout the canal, like the processus vaginalis in the male. This

FIG. 52.



Horizontal Section of Body, showing uterus and round ligaments (Savage); *B*, bladder; *U*, uterus; *C, C*, utero-sacral ligaments; *L, L*, round ligaments; *O, O*, ovaries; *T, T*, tubes; *R*, rectum.

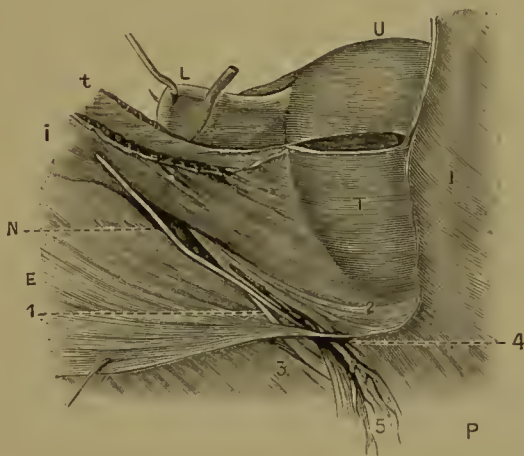
tube of peritoneum is occasionally persistent in the adult, when it is known as the canal of Nuck.¹

On emerging from the external ring the ligament lies close to the outer side of the pubic spine, which forms the surgical guide to it in Alexander's operation. On reaching the anterior aspect of the symphysis it breaks up into a number of fine strands, which are lost in the fibrous tissue of the mons and upper portion of the corresponding labium majus. At the edge of the ring fibres are often given off which are attached to surrounding parts. Three sets have been described and figured—an external, an internal, and a median, the former of which

¹ The importance of this persistence of the peritoneal sheath in connection with the operation of shortening the round ligaments is at once evident.

blend with the outer pillar of the ring close to Gimbernat's ligament; the latter terminate in the upper portion of the external ring, while the internal terminal fibres enter the conjoined tendon. Rainey¹ in his description of the round ligament regards that structure as formed by the coalescence of these three sets of fibres. It seems more correct to

FIG. 53.



Pubic Termination of the Round Ligaments: *P*, pubis where covered by pubic portion of aponeurosis of interior oblique muscle; *U*, fundus uteri; *L*, uterine extremity of round ligament; *E*, aponeurosis of external oblique muscle; *i*, internal oblique muscle; *t*, transversalis muscle; *r*, rectus muscle; *N*, genital branch of genito-crural nerve; 1, external terminating fibres of round ligament into outer pillar of internal ring near Gimbernat's ligament; 2, internal terminating fibres into conjoined tendons of internal oblique muscle and transversalis muscle, near pubis; 3, middle terminating fibres into upper part of external ring; 4, internal pillar of external ring; 5, vessels of round ligament, nervous filaments, and middle terminal fibres of round ligament descending into pudendal sac. (Savage.)

reverse this order. As it emerges from the external ring the ligamentum rotundum has the same coverings as the cord in the male, with the exception of the cremaster muscle—viz. the integument, superficial fascia, intercolumnar fascia, transversalis fascia, and, lastly, the sub-peritoneal fat. In fat subjects the areolar tissue around the ring may be so loaded with adipose that it is difficult to distinguish the ligament; moreover, its size, color, consistency, strength, the point at which it splits up into its terminal fibres,—all of these are subject to normal variations, as the writer has satisfied himself by dissections and operations on the cadaver.

The genital branch of the genito-crural nerve lies first to the outer side, and then in front of the ligament on its emergence from the canal; a little lower down is a plexus of small arteries and veins, among which are several nerve-filaments. The vascular supply of the cord is derived from several sources. Near the uterus it receives

¹ "On the Structure and Use of the Ligamentum Rotundum Uteri," *London Philosoph. Trans.*, 1880, p. 515.

a branch from the ovarian artery that enters the muscular substance and extends in it along the inguinal canal; at the internal ring it has a branch from the deep epigastric which supplies the exterior of the ligament and runs upward to reach the uterus, where it anastomoses with a branch of the uterine artery. A corresponding vein runs with the artery (Fig. 42). In addition, a plexus of veins from the pampiniform surrounds the pelvic portion of the ligament and sends branches along the canal. The lymphatics are derived from the uterine plexuses: they surround the cord throughout its entire extent and terminate in the superficial inguinal glands. The upper portion of the ligament receives sympathetic nerve-filaments from the same plexuses that supply the muscular substance of the uterus, while the genital branch of the genito-crural sends filaments to its terminal portion.

STRUCTURE.—The basis of the ligament is a firm fibrous tissue which we may trace either from the uterus downward, or from the mons and borders of the external ring upward. Near the uterus the ligament has a well-marked covering of smooth muscular tissue, derived from the superficial uterine layer. This covering persists as far as the internal inguinal ring, beyond which point it is not easily distinguishable. Rouget claims to have found striated muscular fibres in the areolar tissue covering the lower end of the ligament; he says that they are derived from the transversalis muscle. Sappey says that “striated fibres come from the lower part of the inguinal canal and from the pubic spine, and ascend to the uterus, but generally disappear at the level of the superior strait.” These, he affirms, are surrounded by the layer of smooth muscle derived from the uterus, “like the sleeve of a coat.” The peritoneal envelope of the ligament, as was stated, is usually wanting below the internal ring.

The anatomy of these cords has attracted considerable attention in connection with Alexander's operation. They are more developed in multiparæ, as they increase in size during pregnancy and do not return to their original size after delivery. The amount of “slack” of the ligament—if it may be so expressed—allows it to be drawn out of the external ring to the extent of three or four inches. The relations of the intrapelvic portion of the ligament to the peritoneum are important; the latter envelops the cord as far as the internal ring, or forms a sheath for it throughout the canal (as the canal of Nuck). Fortunately, this peritoneal sheath can be stripped off quite readily if it is drawn through the external ring with the cord.

The appearance of the round ligament, as exposed in the incision for Alexander's operation, varies greatly, being sometimes a prominent reddish cord, at others a bundle of indistinct, scattered fibres. In very fat subjects, in whom the external ring is filled with a mass of adipose tissue, the difficulty is obvious. It should be observed that the guide

to the ligament is the external ring, which is found according to the usual method, the pubic spine serving as the surgical landmark. The blood-vessels which accompany the cord may lead to its identification in cases of doubt.

THE UTERINE APPENDAGES.

Under the term "uterine appendages" most writers include both the tubes and the ovaries. We shall adopt the ordinary surgical phraseology, reminding the reader, however, that the relations of the two organs to the uterus are essentially different. The tubes are the true "appendages," in the sense that they are originally developed from the uterus and represent the continuation of that organ; the ovaries, on the contrary, are developed independently of the womb, and have no direct connection with it.

FALLOPIAN TUBES.

SYNONYMS.—Oviducts, uterine tubes; *Gr.* *ὄστεροσάλληγες*; *Lat.*, *tubæ Fallopianæ*, *oviductus muliebres*, *cornua uteri*, *vasa deferentia mulieris*, etc.; *Fr.*, *trompes Fallopiennes*, *ou utérines*; *Ger.*, *Eileiter*, *Muttertrompete*; *It.*, *trombe di Fallopio*; *Sp.*, *trompas de Falopio*.

DEFINITION.—Two sinuous tubes, of varying dimensions, which extend outward from the superior angles of the uterus along the upper borders of the broad ligaments, almost to the edges of the pelvic brim.

The tubes vary in length from three to five inches, the right being slightly longer than the left and lying a little lower in the pelvis. Their general direction is first directly outward, then backward and inward, so that each tube has been compared to a shepherd's crook. Three portions are presented for study—the isthmus, ampulla, and fimbriated extremity. The isthmus is the narrowest part of the tube, immediately adjacent to the uterus, and is about an inch in length; it extends from the ostium internum through the uterine wall at the cornu, and then directly outward to the ampulla. It is of a firm, cord-like consistency, and has a diameter of about three millimeters. The lumen is extremely small, only admitting the finest bristle. The ampulla is the outer dilated portion of the tube, its direction being outward, then forward and downward. The diameter varies from six to eight millimeters, while the lumen expands to a diameter of two or two and a half millimeters. The fimbriated extremity (*infundibulum*, *pavilion*) is a funnel-shaped expansion surrounded by a fringe of peculiar fleshy processes (*fimbriæ*), which recall in a striking manner the tentacles of a sea-anemone. The larger processes (four or five in number) are known as "primary" *fimbriæ*; others, which arise from the

primary, are called "secondary" fimbriæ, and vary in number from eight to ten. The longest of the former lies to the inner side of the ostium, and is attached to the outer end of the ovary (fimbria ovarica). It forms a groove terminating at the ostium. A small fibrous band, stretching from the infundibulum to the lateral wall of the pelvis, is known as the infundibulo-pelvic ligament.

The tube has two openings—an internal or uterine, which is found at the superior angle of the uterine cavity, and is of very small size; and a distal opening, the ostium abdominale, already described. Quain states that "a second smaller fimbriated opening not unfrequently occurs at a short distance from the main one."¹

By making numerous transverse sections of the tube the lumen will be seen to vary in diameter at different points, the narrowest part being at, or near, the uterine opening. Remaining of nearly constant size as far as the middle of the isthmus, it then expands suddenly toward the ampulla, where it becomes large enough to admit an average uterine sound. The distal opening is only apparently larger because of the distensibility of the tube at this point.

ANATOMY.—A. *Gross*.—The tube is essentially muscular in its structure, resembling closely the uterus, from which it is an outgrowth. Beneath the serous covering is an outer longitudinal layer, derived from the external muscular stratum of the uterus, and an inner layer of circular fibres which forms the direct continuation of the inner uterine layer. Lining the interior of the tube is a thick layer of mucous membrane, which, being very vascular, is normally of a rosy-red (?) color. After a careful examination of many healthy and diseased tubes immediately after their removal, with a view to determining the normal appearance of their lining membrane, the writer has come to the conclusion that it is extremely difficult to decide this question. In every case in which a ligature is placed around the proximal end of the tube the mucous membrane of the excised portion beyond the ligature is so congested that it appears of a dark-red or bluish color; the same hue is observed in the tubes of women who have died suddenly during menstruation. On the other hand, in specimens removed from the cadaver the membrane is certainly much paler than it is during life. This fact is of importance in connection with the diagnosis of "catarrhal salpingitis," one which is frequently made at the present day by laparotomists.

The membrane is disposed in the isthmus in the form of single longitudinal folds, which in the ampulla assume a more complex structure that is best studied in a cross-section of the tube, observed under a low power of the microscope. Springing from the primary rugæ are numerous secondary and tertiary folds, which present an

¹ *Anatomy* (9th ed.), p. 713. The writer has never observed this anomaly.

appearance almost identical with that of a section made through the wall of a proliferating ovarian cyst. Henning¹ says that he has counted from three to five primary folds and from eight to ten smaller plicæ "between each pair of the former." This statement is somewhat obscure, but the author probably means that these smaller folds spring from the surface of the mucous membrane, and not from

FIG. 54.



Section through Ampulla (Luschka), under low power: *a*, submucous layer; *b*, muscular layer; *c*, serous coat; *d*, mucous membrane; *e, e*, vessels; 1, 1, small primary folds; 2, 2, larger longitudinal and accessory folds; 3, 3, small folds united, forming caualiculi.

the larger projections. There are no rugæ in the intramural tract of the tube. The dendritic arrangement becomes less marked toward the fimbriated extremity, where the longitudinal folds are quite distinct to the naked eye.

The surface of the mucosa is covered normally by a thin layer of grayish mucus, which has a distinct alkaline reaction. The variations in the amount, color, and viscidty of this mucus cannot be definitely stated, and constantly give rise to loose diagnoses of "catarrhal salpingitis." In spite of Bandl's assertion, that he had found catarrh of the tubes in more than half of the specimens that he had examined, the writer believes that one is unwarranted in assuming the presence of a pathological condition of the tubes because of a slight congestion and

¹ *Krankheiten der Eileiter und die Tubarschwangerschaft*, Stuttgart, 1876.

increase in the amount of mucus, both of which occurrences are normal during menstruation. Certainly, no one is justified in making the diagnosis of catarrhal salpingitis simply from a gross inspection of the organs.¹

B. *Minute*.—By a comparison of cross-sections of the tube made at different points it will be apparent that its wall is not of the same thickness throughout. The serous covering extends over the entire tube, ceasing at the ostium abdominale, where it is directly continuous with the mucous lining of the fimbriae; the transition from the flat cells of the peritoneum to the ciliated columnar epithelium of the mucosa is quite abrupt. The peritoneal covering of the tube is strengthened by an increase in the usual amount of fibrous and elastic tissue, and contains a rich capillary network, which can readily be demonstrated without special injections.

The muscular coat of the tube is much thicker in the proximal than in the distal half. The internal, or circular, layer is especially developed at the uterine opening, where a collection of fibres has been described under the name sphincter tubæ.² In a cross-section the outer muscular stratum will be recognized by the presence of the divided spindle-cells, the inner by the groups of cells that are arranged in rows parallel with the circumference of the tube. As in the uterine wall, the circular layer contains the principal vascular plexuses; the divided ends of the arteries and the large gaping veins, surrounded by their zones of fibrous and muscular tissue, present appearances quite similar to those in the uterus. In addition to the smooth muscle, there is a considerable amount of connective tissue in the tubal wall, which is distributed between the bundles of muscular fibres around the vessels and beneath, as well as in, the mucosa. Klein appears to regard the longitudinal stratum as essentially fibrous in character, with a few scattered bundles of smooth muscles.

The mucous membrane of the tube resembles that of the uterus in possessing no well-marked submucosa. Its relation to the subjacent muscle is not so intimate as in the body of that organ, but is more like that of the cervical canal. Although they contain a considerable amount of fibrous tissue, the plicæ in the tube are not so essentially fibrous in their structure as are those forming the arbor vitæ. Under the microscope the membrane is seen to be covered by a single layer of ciliated columnar cells, beneath which are two or three supporting layers of cells round and pyriform in shape. The cilia are best observed in fresh scrapings of the interior of the tube. They are frequently observed moving (although slowly) four or five hours after the removal of the tube from the living subject. Their limited vitality in these cases is perhaps due to the effects of the

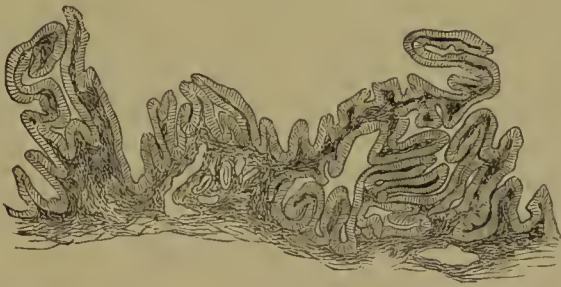
¹ Comp. Bandl (*op. cit.*), p. 8.

² Ibid. (*op. cit.*), p. 2.

ether-narcosis, since that drug is well known to be harmful to them.¹ The presence of its intact lining epithelium, and the persistence and motion of the perishable cilia, are proof positive that no inflammatory process is present in a tube. Moreover, the presence of small collections of mucus-corpuscles on the free surface of the mucosa does not justify the inference that a catarrhal condition is present. The mucous membrane is quite vascular. Sections through the plicæ show that they contain loops of vessels as well as large lymph-spaces.

The arterial supply is derived from the spermatic (ovarian) artery, the distribution of the branches being as follows: As the artery enters

FIG. 55.



Section of the Tube, showing Lymph-spaces (Savage).

the broad ligament, it gives off a special branch to the fimbriated extremity and the outer end of the ampulla; from the ovarian plexus several small twigs run to the middle third of the tube; while the isthmus receives its supply by branches of the main artery and that division of it which runs to the fundus uteri. The veins of the tube enter the pampiniform plexus. The lymphatics unite with those from the ovary. Nerve-filaments reach the tube from the inferior hypogastric plexuses: they have been traced into the muscular tissue, but the manner of their ultimate termination is unknown.

The minute anatomy of the fimbriæ is identical with that of the rest of the tube, and does not require a separate description. The peritoneal connections of the tube (mesosalpinx) will be described with the pelvic peritoneum.

PRACTICAL DEDUCTIONS.—The anatomical relations of the tube enable us to explain the changes which take place as the result of disease. Lying above the ovary and surrounding it, when the tube becomes dilated (as in hydro-, pyo-, hæmatosalpinx, or tubal pregnancy), it sinks, together with the former, to which it is adherent, to a position behind and near the base of the broad ligament, where the

¹ This was first demonstrated by Lister (*Laudois's Manual of Human Physiology*, trans. by Stirling, 1885, p. 614).

two form the characteristic sausage-shaped mass which is felt through the vaginal fornix. The shape of this body and its position at the side of the uterus serve to distinguish it to some extent from a prolapsed ovary. The proximity of the small intestine explains the condition which is commonly found on opening the abdomen in the performance of Tait's operation, the tube, ovary, and intestine being matted together by peritonitic adhesions firmly attached to the posterior surface of the uterus or broad ligament. But the tube may not be occluded; its fimbriated extremity may be merely agglutinated to the ovary as the result of a localized peritonitis. In that case there will be no displacement, except of the distal extremity, which will be drawn inward. The relations of the tube to the ovary are not altered even when the latter becomes the seat of cystic degeneration. As is well known, the tube and mesosalpinx are always found on the exterior of the cyst. When the latter is intraligamentous—*i. e.* has grown inward between the folds of the broad ligament—the tube will be closely applied to the surface of the growth, no mesosalpinx being present. If the cyst is parovarian, both tube and ovary will be attached to the cyst.

The tube forms the principal portion of the pedicle, which is tied before the removal of the appendages, for whatever cause the operation may be performed, hence its proximal portion possesses no little interest for the laparotomist. It is usually tied about half an inch from the uterus. There is no advantage in ligating closer to that organ; in fact, the ligature is liable to slip if the latter course is adopted. The needle transfixes the mesosalpinx midway between the tube and the ovarian ligament, the pedicle being tied in two parts, the upper consisting of the tube, the lower of the ligament and the ovarian vessels.

The continuity of the mucous lining of the uterus and tubes, and of the latter with the peritoneum, suggests a direct channel for the transmission of septic and specific infection, to which it is only necessary to allude. The proximal opening of the tube is rarely much dilated, even when the latter is greatly distended. Cases are on record in which fluid injected into the uterus was supposed to have passed through the tubes and into the peritoneal cavity, with fatal results. It is difficult to see how this could occur during the use of a vaginal injection; and even supposing a fluid was injected into the uterine cavity, and its exit through the cervix was prevented, it would require a tremendous pressure to force it through the minute openings of the tubes. In order to be on the safe side, the reader is advised to inject fluids into the uterus only when he is sure that there is a free return-flow. But the fear of an accident, which is certainly exceedingly rare, should never deter us from the judicious use of intra-uterine injections

when these are indicated. Catheterization and canterization of the tubes, as proposed by Tyler Smith and Froriep, are of course of no practical value, not to speak of the difficulty and danger of the procedure.

The anatomy of the Fallopian tubes is not unimportant practically. The muscular coat may become the seat of hypertrophy (for which condition Mundé has suggested the term "pachysalpingitis"), or it may be greatly thinned when the tube is dilated by accumulations of fluid or the growth of a misplaced ovum. Rupture in the latter case is attended by hemorrhage from the vessels at the placental site, which is often fatal.

The dominant influence over menstruation claimed for the tubes by Mr. Tait gives them a far more important position physiologically than they held a few years ago. Their highly congested appearance during menstruation (especially marked in the mucous lining) must not be mistaken for disease. The diagnosis of "catarrhal salpingitis," as before stated, is sometimes made on insufficient grounds, since the mucous membrane is normally quite vascular and is covered with a layer of mucus. If moving cilia are found in a tube soon after its removal, there can be no extensive inflammation of the mucosa.

OVARIES.

SYNONYMS.—*Gr.* ὠάρια; *Lat.*, ovaria, testes muliebres; *Fr.*, ovaires; *Ger.*, Eierstöcke; *It.*, ovaje; *Sp.*, ovarios.

DEFINITION.—The ovaries are a pair of small oval bodies situated on either side of the uterus, in the posterior folds of the broad ligaments, below the distal extremities of the tubes.¹

POSITION.—The ovaries are situated normally either immediately below the plane of the pelvic brim or partly above and partly below.² The true position of the vertical axis of the ovary has formed the subject of no little controversy. Olshausen maintains that it extends outward and backward, forming with the transverse axis of the uterus an angle that opens backward. Hasse, on the contrary, believes that the direction of the axis is outward and forward. Kölliker describes the axis as parallel with the iliac vessels, and figures the ovary as not only occupying an oblique position with regard to the uterine axis, but as being also tilted in such a manner that its surfaces look inward and outward and its rounded border upward and forward. Schultze figures the ovary with its long axis at right angles to the transverse axis

¹ Small accessory ovaries have been observed by Hermann, Beigl, De Sinéty, and others. These are probably not separate organs, but rather detached portions of ovaries, the anomaly being explained by irregularities of development.

² One-half of the ovary is above the plane of the brim, according to Hart and Barbour.

of the pelvis, while His even insists that it occupies normally a vertical position, its rounded border looking directly backward. The writer has never been able to satisfy himself that the normal position of the organ is the one last mentioned, and that it is not the result of some previous localized inflammation resulting in the formation of slight adhesions, such as are more often present than absent in subjects examined at the autopsy-table. In fact, it is hardly possible to affirm dogmatically that a certain position of the ovary is normal, and that all other positions are abnormal, any more than this can be urged of the uterus. The ovaries are certainly not fixed organs, and are subject to normal variations in their position, although within circumscribed limits. The reader may content himself with the statement that the axes of the organs do not lie exactly in the transverse axis of the pelvis, but slightly oblique to it, while at the same time there is a nutation, or inclination forward.

RELATIONS AND ATTACHMENTS.—The ovary may be regarded as lying in the plane of the pelvic brim. It is described by Spencer Wells as situated in a depression in the posterior fold of the broad ligament; perhaps it would be more correct to say that it lies in front of it, being attached by its anterior border or hilum to the anterior fold. In front is the anterior fold of the broad ligament, separated from the ovary, except at the hilum, by a plexus of vessels and nerves. The round ligament also crosses in front of the organ. Above and somewhat in front is the Fallopian tube, separated from the ovary by the mesosalpinx above and by the parovarium on the outer side. The tube encircles the outer extremity of the organ, so that the fimbriated portion finally lies below the convex border. The left ovary is in contact with coils of small intestine (at least when the bladder is empty); the right is in close relation to the rectum, especially when the latter is distended. The inner extremity of the ovary is connected with the cornu of the uterus by the ovarian ligament, a small fibromuscular cord about an inch in length, which springs from the lateral border of the uterus immediately below the origin of the Fallopian tube, and receives unstriated muscular fibres from the external layer of the uterus, and fibrous tissue from the tunica albuginea of the ovary. It lies in the posterior fold of the broad ligament, and receives a complete peritoneal investment. Hart and Barbour regard it as simply a "longitudinal fold of the peritoneum, into which the unstriated muscular fibre of the uterus is prolonged." The upper border is continuous externally with the ovarian fimbria which connects the ovary with the infundibulum. The lower border is continuous with the infundibulo-pelvic ligament.

The ovary is usually designated as an oval body. It is more properly described as a "flattened ovoid," one-third of one lateral

segment of which is replaced by a straight side (Spencer Wells), the broad, rounded end being directed outward, while the smaller, pointed extremity extends toward the uterus. Both the anterior and posterior surfaces are convex, the latter being the broader and more rounded of the two. The organ is subject to many variations in shape. It may be fusiform, globular (like an oblate spheroid), discoid, or of a strictly oval form.

The size varies with the age of the subject, the functional activity of the organ, the occurrence of menstruation, pregnancy, etc. According to Henning, the ovary attains its largest size six weeks after parturition, when its ordinary dimensions (especially its length) may be doubled, and it never returns to its original size after involution. After the menopause the organ shrinks to one-half, or one-third, of its dimensions during sexual activity, and assumes a somewhat fusiform shape. The average measurements given by Farre are: Length, $1\frac{1}{2}$ inches, width, $\frac{1}{2}$ th of an inch, thickness, 1 inch. Luschka states that the average is: Length, 4 centimeters, width, 2.2 centimeters, thickness, 1.3 centimeters. The weight of the normal ovary varies from 60 to 135 grains, the average weight in a healthy nullipara being 87 grains.

The color of the ovary is well described by Tait as "a pinkish, pearly hue, with here and there a hazy blueness showing through the tissue, when a follicle is either getting ready for the discharge of its nucleus or is disappearing after having fulfilled its function."¹ This description applies rather to the quiescent organ in the virgin or young nullipara. During menstruation it appears of a darker hue, while the ripe Graafian vesicles assume a purple color, which changes to a dark-red or brown after the discharge of their contents; yellowish spots represent so-called corpora lutea. After the menopause the ovary becomes of a whitish color and almost cartilaginous consistence. Before puberty its surface is uniformly smooth, but as menstruation occurs it becomes covered with depressions and cicatrices, marking the sites of the ruptured vesicles, until the senile organ is transformed into a hard, irregular mass of scars and nodules.

ANATOMY.—A. *Gross*.—In approaching this subject, it may be well to remind the reader that much confusion exists at the present time with regard to what constitutes a perfectly normal ovary. Judged by the ordinary standards of anatomical normality, such an organ is rarely found either in the dead-house or at the operating-table. Even when it appears on gross inspection to offer no departure from the normal, histologically there may be found in an ovary changes that would be regarded as pathological if found in other organs. On the other hand, ovaries that are apparently the seats of degenerative changes may discharge their functions so perfectly as to satisfy the demands of all except

¹ *Diseases of the Ovaries* (4th ed.), p. 5.

the ardent laparotomist. In other words, the boundary between the normal and pathological is not a fixed one, and in spite of numerous careful studies of the subject there yet remain many mooted points. Many of the classical drawings that have been copied by several generations of writers are largely diagrammatic, having been constructed as the result of careful comparisons instituted between sections of the human ovary and those of the lower animals, especially the cat. This caution may serve to soften the disappointment experienced by the student after his repeated failures to hit upon sections that correspond exactly with the familiar illustrations of the textbooks. The microscopist who succeeds in determining to what extent an ovary may contain cysts without being "cystic," and just how much fibrous tissue must exist in its stroma before the diagnosis of "cirrhosis" is justifiable, will deserve no little praise.

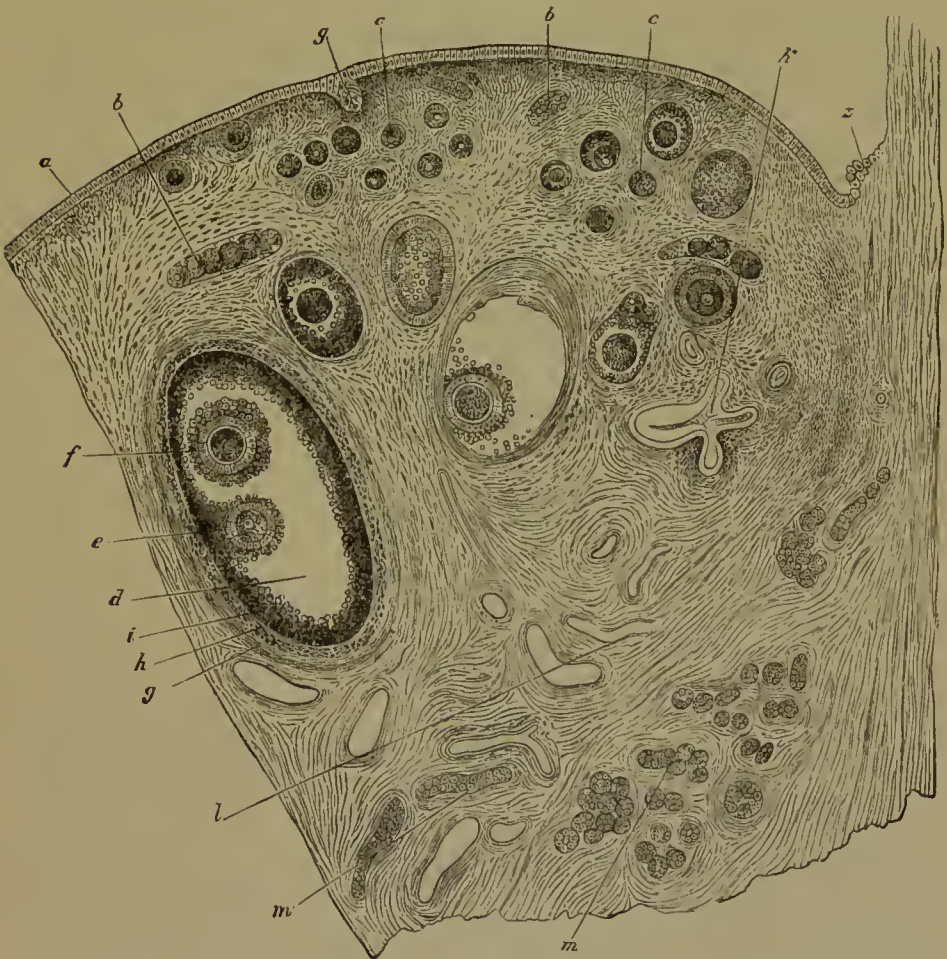
In describing an ovary we may consider its extremities, borders, and surfaces, two of each. The inner extremity, which is distant about an inch from the uterus, is long and pointed, and tapers gradually into the ovarian ligament. The outer is thickened and rounded, and is situated more posterior, with reference to the transverse axis of the pelvis, than the inner; to it is attached the fimbria ovarica before mentioned, which is sometimes regarded as one of the ovarian ligaments.

The borders of the ovary are designated "upper" and "lower," and its surfaces "anterior" and "posterior." Considering the true position of the organ, it is more correct to reverse the terms, the surfaces being termed upper and lower. The posterior border is convex, and is free, or not covered by peritonem; the anterior is straight, somewhat flattened, and is attached to the posterior fold of the broad ligament. It is known as the hilum, and is the portal through which the vessels and nerves of the organ enter. The superior surface is nearly flat, and looks upward and forward, while the posterior is decidedly convex and is directed downward and backward.

On making a longitudinal section of an ovary from a healthy adult there will be presented two zones of tissue—a central and a peripheral. The former has a pinkish-gray or even rosy hue, is of soft consistence, and has a moist, glistening appearance. The peripheral zone is white or grayish-white, and has a firm, semi-cartilaginous (or, more properly, ligamentous) structure. The former is evidently well supplied with vessels, especially near its margin, while the latter seems to be non-vascular. A closer examination of the cut surface will reveal the presence of numbers of small pits and vesicles of variable size, those near the periphery being the smallest as well as the most numerous; imbedded in the central portion of the surface are several of these cystic bodies of much larger size, while in the peripheral zone are a few vesicles, the size of small peas, which are filled with clear fluid.

The latter bodies project more or less above the free surface of the ovary, and one or two of them will generally be so distended with fluid and thin walls that they rupture on the application of slight pressure. In the periphery will also be seen the remains of ruptured ovisacs in all stages of retrograde metamorphosis, from a blood-clot to a firm, bloodless cicatrix. The general disposition of the bands of fibrous tissue in the stroma are also evident to the naked eye, although

FIG. 56.



Section of the Ovary of an Adult Bitch : *a*, germ-epithelium; *b*, egg-tubes; *c, c*, small follicles; *d*, more advanced follicles; *e*, discus proligerus and ovum; *f*, second ovum in the same follicle (this occurs but rarely); *g*, outer tunic of the follicle; *h*, inner tunic; *i*, membrana granulosa; *k*, collapsed retrograded follicle; *l*, blood-vessels; *m, m*, longitudinal and transverse sections of tubes of the parovarium; *y*, involuted portion of the germ-epithelium of the surface; *z*, place of the transition from peritoneal to germinal or ovarian epithelium. (Waldeyer.)

the more complex interlacement is only apparent under the microscope. These fibres not only radiate in all directions from the hilus, but also surround the ovisacs and vessels. The vascular richness of the organ is best appreciated in injected specimens, but the divided ends of

numerous arteries will be seen on the cut surface of the ovary even in its natural state.

B. *Minute*.—The microscopical anatomy is so important that the writer feels justified in devoting to it what may seem like a disproportionate amount of the limited space at his disposal.

Three points are presented for study—the exterior of the ovary, the fibrous (or fibro-muscular) tissue, and the Graafian vesicles. The external covering is best observed in fresh preparations that have been specially stained. Contrary to the opinion of Waldeyer, Leopold, Klein, and many other microscopists who have carefully investigated the matter, Mr. Tait confidently affirms that “the posterior surface, when treated by silver and other staining methods, displays the same stomata and stigmata as does the anterior surface”—in short, that the ovary is entirely covered by a layer of peritoneum, the presence of which on the posterior surface can be recognized by finding the squamous epithelium which is characteristic of that membrane.¹

Without entering into a discussion in which the weight of evidence is decidedly against the writer just quoted, it may be stated that most authorities are in accord in the belief that the free surface of the organ (*i. e.* the posterior surface, which projects beyond the hinder fold of the broad ligament) is covered by a single layer of short columnar epithelia, which has received from Waldeyer the name “germinal epithelium,” because, in his opinion, the primitive ova are developed from it, the young ova themselves being represented by the occasional large spheroidal cells with prominent nuclei which are observed among the columnar cells.² These are most numerous in the ovaries of young girls, in which ingrowths of the germ-epithelium into the underlying stroma are sometimes seen (ovarial tubes of Pflüger). At the attached border of the ovary (the so-called “white line”) there is an abrupt transition from the columnar to the squamous epithelium of the peritoneum.

The epithelial layer rests directly upon the tunica albuginea, a thin layer of condensed fibrous tissue containing a small number of smooth muscular fibres; although this capsule is quite sharply differentiated from the underlying stroma, the two are inseparable. The albuginea does not become completely developed until the third year. It undergoes changes corresponding with the age of the subject, becoming, as the result of prolonged ovulation and senile atrophy, so dense as to resemble fibro-cartilage. This physiological change is undoubtedly often regarded as pathological by superficial observers. Henle³ states

¹ *Op. cit.*, p. 6.

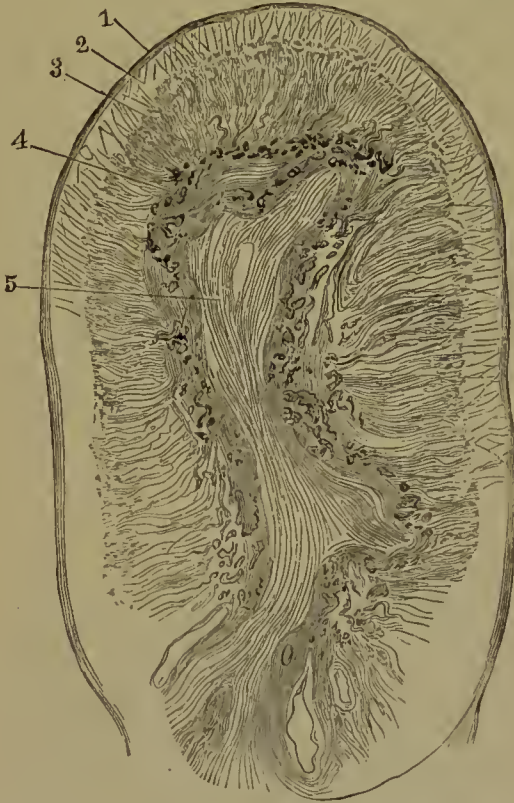
² Waldeyer, *Eierstock u. Ei*, Leipzig, 1870; also Stricker's *Handbuch*, p. 545.

³ *Handbuch der Eingeweidelehre*.

that in man three separate layers are distinguishable in the albuginea, the fibres of the outer and inner being longitudinal, while those of the middle layer have a circular direction.

The ovarian stroma or parenchyma is divided into two zones—an outer grayish cortical (parenchymal zone), and an inner pinkish medul-

FIG 57.



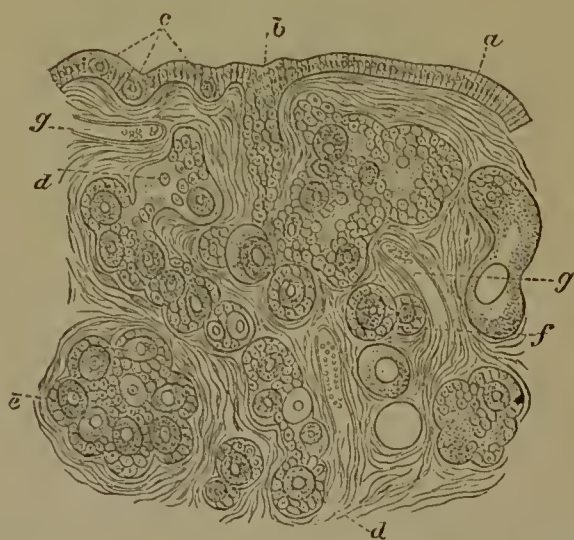
Longitudinal Section of the Ovary, under a low power (Henle): 1, albuginea; 2, fibrous layer of cortical portion; 3, cellular layer of cortical portion; 4, medullary substance; 5, loose connective tissue between the firm medullary layers.

lary (zona vasculosa). There is no essential difference between the structure of the two, except that the latter is softer and more vascular.

The cortex is composed of bundles of connective tissue, among which are scattered elastic and muscular fibres; imbedded in the tissue are numbers of Graafian vesicles of the smallest size. Under the microscope the cortical zone presents an outer layer (called by Henle the "fibrous" layer), in which the fibrous tissue is firmer than in the deeper portion, the bundles of fibres forming a dense network. In the deeper part of the cortical zone the connective tissue is looser and has a radiating appearance from the centre toward the periphery. A curious feature of the tissue here is the presence in it (especially in the vicinity of the vesicles) of numbers of cells, both round and fusiform,

some of the latter possibly representing bundles of smooth muscle-fibres. There was formerly much difference of opinion as to the significance of these spindle-cells, many authorities denying that they were fibre-cells. There is little doubt that the stroma contains a considerable amount of muscular tissue, which is most abundant in the neighborhood of the larger vessels. The majority of these fusiform cells, which have prominent oval nuclei, doubtless belong to connective tissue in an early stage of development. This inference is justified, 1, by the fact that the cells are, as a rule, shorter and broader than the fibre-cells in the muscular strata of the uterine wall; 2, by the variable size of the cells, some of which are short and nearly oval in shape, while others are long and tapering, showing that there is some process of growth or development going on among them; 3, the cells are seldom arranged in groups, as in smooth muscle, but are scattered throughout the connective tissue, to which they bear an intimate relation. Some authorities go so far as to say that all of the spindle-cells in the stroma represent muscular tissue. Of the round and polyhedral cells scattered throughout the stroma, some are leucocytes, while others come from the foetal Wolffian body and are analogous to the interstitial cells of the testicle; some of the round

FIG. 58.



Vertical Section through the Ovary of a newborn Infant (Waldeyer): *a*, germinal epithelium; *b*, ovarian tube; *c*, primitive ova; *d*, longer tubes becoming constricted to form Graafian vesicles; *e*, large cell-nests; *f*, isolated ovisacs; *g*, *g*, blood-vessels.

cells, as well as the fusiform, undoubtedly belong to the young connective tissue type. Into the cortical zone (in the ovaries of young subjects) project those curious cell-columns before alluded to under the name "ovarian tubes." They are simply ingrowths from the layer of germ-epithelium, with which they are directly continuous. A detailed

description of these belongs rather to the province of embryology.¹ From the large number of small ovisacs that exist in the cortical layer it has been called by Sappey *couche oögène*. But not all of these bodies deserve the name of Graafian vesicles, since many of them represent merely collections of embryonal cells that have not yet reached the dignity of fully-formed vesicles, while others are groups of fatty degenerated epithelial cells. The vesicles will be described separately. The vascular supply of the cortex is not so rich as that of the medulla. The larger and medium-sized arteries are surrounded by fasciculi of elastic and muscular fibres. Each of the ovisacs is surrounded by a fine network of capillaries.

In the medullary portion of the ovary the character of the stroma undergoes a change; it becomes looser and more vascular. Although the tissue contains the same elements as in the parenchyma, the bundles of fibrous and elastic tissue and smooth muscle-fibres are not so close together, but interlace in all directions. The non-striped muscle may be traced directly through the hilum (with the blood-vessels) into the broad ligament. The bands of fibrous tissue also radiate from the hilum, as well as the nerves and vessels. The blood-vessels of the parenchyma are large and numerous. Entering the ovary at the hilum, the arteries pursue a spiral course through the stroma, their branches terminating in capillary networks around the vesicles. The veins, which begin in small efferent twigs from the above-mentioned plexuses, are tortuous like the arteries, and may be traced to the hilum, where they leave the ovary to enter the bulb. The lymphatic supply of the parenchyma is particularly rich. By means of proper injections the distribution is seen to be similar to that of the arteries and veins. Each vesicle is surrounded by a fine network of lymphatics, while the ultimate termination of the system is in the plexuses of the broad ligament. As was stated before, both the arteries and veins present an appearance on cross-section similar to that of the uterine vessels. The lumina of the arteries are small in comparison with their diameters, their fibrous and muscular coats being quite thick, while the veins are imbedded in the fibrous stroma with which they are surrounded. The smooth muscle-fibres are especially distinct around the larger arteries.

The nerve-fibres can be traced from the hilum into the stroma in the vicinity of the larger vessels, but their ultimate endings in man have not yet been described. Elischer of Buda-Pesth has studied the ovaries of the lower animals with a view to settling the question of the termination of the nerves. He states as the result of his observations that medullated fibres after entering the hilum

¹ Vide F. M. Balfour, *Treatise on Comp. Embryology*. Quain (*Anat.*, 9th ed.) gives a full bibliography.

branch in a dichotomous manner, and lose their medullary sheath when they reach the neighborhood of the vesicles, around which they form loops. The larger the vesicle, the more distinct is its nervous plexus; a fine secondary network arises from the primary filament and rests upon the outer layer of the membrana granulosa. The same observer claims that he has traced the terminal fibrils to the cells of the granular layer, where they probably end in the nuclei. The larger vessels, he says, are also surrounded by plexuses of nerves.

Graafian Vesicles.—The stroma of the ovary constitutes merely the framework or bed in which rest the ovisacs. The former may be said to exist simply for the nourishment of the latter. In order to understand properly the nature of these important bodies, it will be necessary to trace briefly their development and ultimate fate. For details the reader is referred to works on embryology.

Whether the vesicles are formed from ingrowths of the germ-epithelium, according to Pflüger's theory, or, *per contra*, by outgrowths of the stroma into the epithelial layer, as Balfour believes, or, as Klein suggests, by "mutual ingrowth" of both epithelium and stroma, certain it is that at an early stage in fetal life groups of cells undergo a special differentiation. Some of these cells become enlarged and their nuclei prominent, forming the primitive ova, while others of the same group remain as the membrana granulosa. In the ovary of an infant there is seen immediately beneath the tunica albuginea a granular layer which, when examined under a low power, appears to be filled with minute bodies that represent immature vesicles; still deeper in the substance of the organ are larger vesicles containing ova. Toward the time of puberty these latter vesicles increase in size and advance from the deeper part of the stroma into the cortical zone. They continue to enlarge, make their way through the albuginea (the tissue of the latter becoming atrophied), and form small projections on the surface of the ovary. The fluid contents of the vesicle increase, its wall becomes thinned, especially at one point, toward which the vessels run (stigma), and ultimately rupture takes place.

The mature vesicles vary greatly in size, the largest being about $\frac{1}{20}$ th of an inch in diameter, while the smallest may not exceed $\frac{1}{100}$ th of an inch. Each vesicle has an external covering of connective tissue (tunica fibrosa, theca folliculi externa of Henle) which may be separated into two layers—an outer, containing the vascular plexuses before alluded to, and an inner, in which are the delicate capillaries that supply nourishment to the ovum. The external stratum is merely a condensation of the stroma, and hence in it are seen numbers of the spindle-cells that fill the tissue of the former; the inner is more complex in its structure, and contains a variety of cells, round, polygonal, stellate, and fusiform. The round cells possess the amoeboid property

of leucocytes. The immediate lining of the vesicle is a layer of flat cells with single oval nuclei, external to which is a layer of columnar epithelia. The latter rest upon a delicate stratum of connective tissue known as the *membrana propria*. The interior of the ovisac is mostly filled by a clear albuminous fluid, in which float a few fatty particles and cells (*liquor folliculi*), while at one side of the cavity (generally that most removed from the surface of the ovary) there will be seen a delicate transparent body—sometimes two, rarely three—surrounded by a collection of cells from the *membrana granulosa*, called the *discus proligerus*. The cells forming the latter have been divided into two layers—the “egg-epithelium,” that lies adjacent to the ovum, and the “follicular epithelium,” which is external to the former.

The ovum itself has been aptly called “a typical cell.” It is a yellow, spherical body having a diameter of about $\frac{1}{20}$ th of an inch, surrounding which is a thin hyaline membrane (*vitelline membrane*, *zona pellucida*), which is doubtless formed from the innermost cells of the *discus proligerus*. Within the *zona pellucida* (in which fine pores have been described) is the *vitellus*, a mass of granular fibrillated protoplasm containing numerous fat-globules, the central portion of the protoplasm being less opaque than the peripheral. Somewhere on the outer edge of the central zone of the *vitellus* is a light spot, which under a high power appears as a delicate network of fibrillated protoplasm, in the meshes of which is a quantity of finely granular material, the whole being enclosed in a distinct membrane (*nucleus* or *germinal vesicle*). Within the latter is a small, highly-refracting granular body (*nucleolus* or *germinal spot*), not over $\frac{1}{3000}$ th of an inch in diameter, which occupies the same relative position to the contents of the vesicle that the latter does to the interior of the ovum. When strongly magnified the *nucleolus* appears only as a mass of finely granular material. This brief description applies to a mature ovisac, such is as seen at the periphery or on the surface of the ovary. Between these and the undeveloped vesicles ($\frac{1}{1000}$ th of an inch in diameter) there are ovisacs of various sizes and forms. In the small and medium-sized ones the cavity is entirely filled by the ovum. As the vesicles increase in size the latter becomes larger and occupies a relatively smaller portion of their interior, while the *zona pellucida* becomes thicker.

It is impossible in this place to study the interesting subject of the degeneration, or arrested development, of the ovisacs. Doubtless the small, irregular collections of epithelial cells scattered about in the stroma, the localized thickenings of the latter (not unlike cicatrices in their microscopical structure), and other anomalous appearances frequently described as pathological, all represent the remains of Graafian bodies that have perished, as it were, in the midst of the stroma,

without ever coming to maturity or being able to reach the surface. The mere mention of these facts will serve to indicate to the reader the possibilities that lie before the original worker.¹

In considering the unruptured vesicle and its contents we have referred only to the initial period in its history. If such a vesicle be examined just as it is on the point of rupturing, it will be found to be distended to its utmost capacity, while over its thin, transparent wall run engorged capillaries. Immediately after rupture the cavity is filled with coagulated blood derived from the torn vessels. A few weeks later the periphery of the clot has become of a yellowish color, while its centre has more of a reddish-gray hue. The walls of the cavity contract, compress the clot, and thus throw the yellow zone into the convolutions which are so familiar to every one. The mass is now known as the corpus luteum. The yellow ring increases in width, gradually encroaching upon the central portion, until almost the entire mass becomes yellow. As viewed under the microscope the change may be briefly explained as follows: The original peripheral zone of the corpus luteum consists of fatty degenerated cells from the membrana granulosa, into the midst of which penetrate offshoots of fibrous tissue and capillary vessels derived from the wall of the ovaries. In the centre of the clot there will be seen many large pigmented cells and crystals of hæmatoidin, together with newly-formed blood-vessels. Ultimately the pigment disappears, and the fatty cells (which give the yellow tinge to the mass) encroach upon the central zone until it loses its original appearance entirely, and is represented by a small quantity of mucoid tissue. The final stage of retrogression is the transformation of the cells into a mass of fat-globules, the vessels disappearing. The fat is then absorbed, the surrounding fibrous tissue contracts, and a white depressed cicatrix (corpus albicans) alone remains to mark the site of the former vesicle. If the ovum from the vesicle in question becomes impregnated, the degenerative changes are retarded, and the corpus luteum is nourished for some time by the rich development and persistence of the newly-formed vessels; hence it becomes larger than the one just described, while the convoluted appearance of its yellow border is much more striking.²

It will be evident to the reader, even after this superficial view of the minute anatomy of the ovary, that its structure is not only a complex one, but that it is not always easy to state when the organ is entirely normal and when it is not. The fact that it is the seat of constant changes, beginning in fetal life and continuing till after the menopause, should lead us to be cautious in giving an opinion as to

¹ For an ingenious essay on the fate of the ova see Dr. Creighton's paper in the *Journal of Anat. and Physiol.*, vol. xiii.

² Refer to Dalton's *Physiology* for details and illustrations.

the presence of abnormal conditions. Whether we examine critically the stroma or the ovisacs, the conclusion is unavoidable that the boundary-line between the normal and pathological is not a fixed one. Thus the degenerative changes consequent upon the senile state may easily be mistaken for cirrhosis, while the diagnosis of cystic degeneration may be made because of the presence of a few vesicles that are somewhat above the usual size, though they may contain perfect ova. The practical deduction is self-evident. The diagnosis of ovarian disease requires for its support the aid of the microscope, as well as a thorough acquaintanceship on the part of the observer with all of the possible variations in the appearance of the normal organ.

The ovary receives a portion of its blood from the ovarian artery (Fig. 49), which arises directly from the aorta, like the spermatic in the male, and has a course similar to that vessel until it reaches the pelvis. Having reached a point near the pelvic brim, the ovarian artery makes a bend inward, enters the broad ligament, and runs between the folds of peritoneum upward and inward to the upper angle of the uterus. In its tortuous course and in the manner of distribution of its branches it resembles the splenic artery. On reaching the uterus, or just before, it divides into two branches, one of which supplies the fundus and joins the vessel of the opposite side, while the lower and larger branch descends along the lateral border of the uterus, giving off numerous parallel twigs of a curious spiral form, and finally anastomoses with the uterine artery. Soon after entering the broad ligament, the ovarian vessel sends three or four large branches to the distal end of the tube, then a group of extremely tortuous vessels which ramify over the surface of the ovary and enter the hilum. Near the point of division other twigs are given off, which run to the proximal end of the tube, while there is a special branch to the round ligament. It is impossible to give a clear view of the richness of the vascular supply of the pelvic organs and of the intricate anastomosis which takes place between the vessels that run in the broad ligaments. A glance at one of Hyrtl's or Savage's plates will teach more than pages of description. The reader is referred to these as the best substitutes for actual dissections, which latter are not only very difficult, but require careful preliminary injections. Attention should be called to the most marked peculiarity of the ovarian artery, which extends to its minutest branches—its extreme tortuosity. It is hardly necessary to remind the reader of the physiological fact that this peculiarity is one observed in many arteries which supply organs of the turgescient type.¹

The ovarian capillaries terminate in veins that emerge from the hilum and enter a mass of veins which is situated along the lower

¹ Sappey (*Traité d'Anatomie*, Paris, 1874, tome iv. p. 691) denies the truth of Rouget's assertion that the ovary is an erectile body.

edge of the organ and is known as the "bulb." Savage describes it as a "club-shaped venous body in which the ovary and utero-ovarian ligament are partly imbedded." It communicates freely with the veins from the upper part of the uterus and from the tube (as well as with the uterine plexus), forming with them an intricate network, known as the ovarian or pampiniform plexus. This plexus terminates in the ovarian or spermatic vein, which on the right side empties directly into the vena cava inferior, but on the left joins the corresponding renal vein. There is a well-marked valve at the termination of the right, but not of the left, spermatic vein.¹

Reference has been made to the distribution of the nerves and lymphatics. The lymphatics of the ovary unite with those from the tube and upper portion of the uterus, and enter the lumbar glands. The nerves arise from the spermatic plexus and accompany the arteries.

PAROVARIIUM.

DEFINITION.—A triangular group of small tubules situated in that portion of the broad ligament which intervenes between the outer end of the ovary and the distal extremity of the Fallopian tube. The apex of the triangle touches the upper border of the ovary.

This curious body, analogous in its structure to the epididymis, is usually dismissed by anatomists in a few words as the "remains of the Wolffian body." Doran² deplors the general want of interest that prevails with reference to a structure that ought to be regarded by gynecologists as of no little importance, because of its relation to certain morbid growths. The tubes or fibrils forming the parovarium vary considerably in number. There may be only half a dozen, or as many as twenty-five or thirty. They lie in the midst of the delicate cellular tissue which exists between the folds of the broad ligaments, and have no close attachment to any of the surrounding parts. Beginning at or near the hilum of the ovary, they ascend in parallel rows and enter a transverse tube or canal which terminates in a cul-de-sac—sometimes in a cystic dilatation—near the fimbriated extremity of the tube. Beyond the point at which the lumen of this transverse tube disappears, the latter can still be traced as a delicate cord which extends inward toward the uterus, but is lost before it reaches that organ. This is the persistent duct of Gartner, which Doran found in upward of one-fifth of the specimens examined by him. Attempts have been made to trace a direct connection between these ducts and the so-called "Skene's glands" at the meatus urinarius, but Dr. Schüller³ of Berlin has dis-

¹ For a discussion of the practical significance of this fact, *vide* Tait, *op. cit.*, pp. 7-9.

² *Tumors of the Ovary and Broad Ligament*, London, 1885.

³ *Beiträge zur Anatomie der Weibl. Harnröhre*, Berlin, 1883.

proved the theories of his predecessors. The vertical tubes are of different sizes and show various degrees of development, those which are most internal being generally merely threads of fibrous tissue, while a half dozen or more of the external tubules show under the microscope a well-marked lumen, which is lined by a single layer of ciliated columnar epithelium resting upon a fine *membrana propria*. The latter consists of fibrous tissue containing a small quantity of smooth muscle: two layers have been described, the outer consisting of circular fibres, while the inner run in a longitudinal direction. This description applies to an exceptionally perfect tubule. As a rule, the lumen, if it exists at all, is filled with a mass of degenerated epithelial cells imbedded in a mucoid fluid. The duct of Gartner is seldom anything more than a fibrous cord. Cystic dilatations are frequently observed in the course of the tubules, the most common being the pedunculated vesicle known as the "hydatid of Morgagni," the pedicle of which springs from a point in the mesosalpinx to the inner side of the fimbria ovarica. It is generally regarded as the result of dilatation of the upper extremity of the fetal duct of Müller. The other cysts around and within the parovarium are really pathological appearances.

PRACTICAL DEDUCTIONS.—Can the normal ovaries be detected by the bimanual touch? Opinions on this subject vary. In thin subjects the practised examiner may be able to feel them, but we venture to affirm that it is only under the most favorable circumstances that they can be felt through the abdominal wall. By practising the rectal or vesical touch, the uterus and its appendages being at the same time depressed from above or drawn down from below, the gland may often be distinctly recognized. According to Mundé, the normal ovary is not so insensitive as has been claimed, but a peculiar sickening pain can be produced by deep pressure upon it. The mobility of the normal organ, as well as its situation in the pelvis, prevents it from being reached through the vaginal fornix; hence when it is readily felt by the vaginal touch alone, the inference is that it has sunk below its normal plane.

Remembering the rather loose attachments of the ovary, and the fact that it "floats at a certain level" in the pelvis, the etiology of prolapsus becomes almost self-evident. Stretching of the ovarian ligament or increase in weight of the organ (both conditions being a normal accompaniment of pregnancy) will naturally destroy its adjustment and cause it to sink downward. Traction, from displacement of the uterus, adhesions, enlargement and prolapse of the tube, etc., is a common cause. As the ovaries sink downward and backward (the usual course), they rest at first upon the "retro-ovarian shelves," as Polk has called the two sections of the posterior fossa of the pelvis that lie above

the level of the sacro-uterine ligaments; subsequently they may descend into Douglas's pouch. Every reader must have noticed the greater frequency with which the left ovary is thus displaced. This difference is explained by reference to the fact that the left ovary is more often diseased—a fact which depends upon a chain of anatomical causes, not the least of which is the valveless condition of the left spermatic vein, so that this vessel is readily affected by any obstruction to the general circulation. The rectum encroaches on the left retro-ovarian shelf, so that the corresponding ovary tends to glide off from it into the true pouch of Douglas. The anatomical relations of the displaced organ explain the pains which attend defecation, as well as coitus; these are especially aggravated when the organ is fixed in its abnormal position. From the brief statements which were made regarding displacement of a diseased tube, with or without the corresponding ovary, it will be inferred that not only the shape, but the position of a tender body behind the uterus, may give some clue as to whether it is an ovary or a tube. A positive differential diagnosis is seldom possible at the examining-table. Although the circulation in the ovarian vessels is doubtless interfered with when the gland is much displaced, there is probably less obstruction than there would be if they were not so long and tortuous.

When the ovary becomes the seat of tumors, its relations to neighboring organs are greatly changed; still, by remembering them, we are often enabled not only to make a correct diagnosis, but to explain certain complications. Among the points to be borne in mind, the most important is the position of an ovarian tumor (at least before it has grown so large as to fill the abdomen) with reference to the uterus—*i. e.* at the side of that organ. The attachment of the tube and mesosalpinx to a pelvic tumor always gives a clue to its origin, even when its nature is not clear at the time of the operation.

The relations of the ovary to the broad ligament, as well as to the Fallopian tube, indicate fruitful sources of disease; the well-known frequency of localized peritonitis around the distal extremity of the tube requires no comment. Oöphoritis and perioöphoritis are hardly separable; how many of the symptoms observed in these cases are due to disease of the ovary, and how many to the surrounding peritonitis, it is not often possible to decide.

The normal anatomy of the gland should be thoroughly studied at the present day when so many ovaries are removed for real, or supposed, disease. From what has been said regarding the variations in shape, size, and external appearance, it may be inferred that there are many opportunities for error when we attempt to decide delicate shades of difference between the normal and pathological by a hasty inspection of the organ. The normal histology of the ovary is a key to the know-

ledge of the etiology of its diseases. We must be thoroughly familiar with the appearance of the stroma in order to detect hypertrophy of the fibrous tissue; with the Graafian vesicles in order to recognize small pathological cysts; while a study of the epithelial covering is a necessary introduction to that of cyst-formation. The changes in the cortex resulting from the rupture of ovisacs or from senility must be carefully distinguished from the thickenings due to chronic inflammation.

The remarks concerning the general pelvic circulation cover that of the ovary. The arrangement of its vessels is such as to favor sudden and excessive engorgement, which might easily become pathological. Subperitoneal hæmatoma, the result of hemorrhage from the ovarian vessels, is readily conceivable, and doubtless occurs at the time of the menstrual period more frequently than we imagine. Hemorrhage into Graafian vesicles, and thence into the peritoneal cavity, has often been recorded, and Savage has shown by a series of interesting cases how the subovarian plexuses may rupture and fatal hemorrhage ensue. The sudden appearance of acute abdominal pain and collapse during menstruation should at once awaken the suspicion that this accident may have occurred, even when no information can be derived from a physical examination. The treatment, with our modern views on abdominal surgery, is evident. The intimate relation between the vessels supplying the pelvic organs precludes the possibility of engorgement in one without at least some disturbance in the rest. Thus the ovary sympathizes with uterine affections. It is the centre of reflex neuroses which are not always explicable by reference to anatomical facts; mammary pain (generally on the same side as a diseased ovary) is a familiar example.

To the various neoplasms and their origin we can only refer; that they are formed from pre-existing elements will be evident to the student of normal histology.

THE URINARY TRACT.

That portion of the tract which is usually described with the genital organs includes the urethra, the bladder, and the termination of the ureters. These will be considered in the same order as were the genital organs—that is, from below upward.

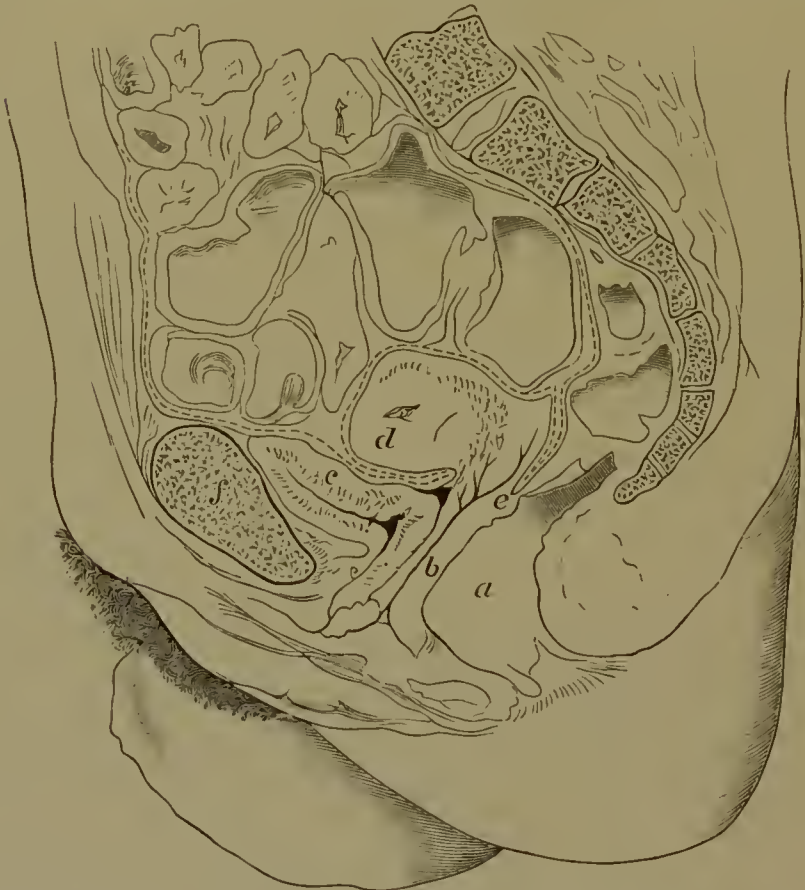
URETHRA.

SYNONYMS.—*Gr.*, οὐρήθρα; *Lat.*, canalis urinarius, urethra, iter urinarium; *Fr.*, urèthre, urètre; *Ger.*, Harnröhre; *Sp.* and *It.*, uretra.

DEFINITION.—The female urethra is a short canal imbedded in the anterior vaginal wall, extending from the meatus urinarius to the neck of the bladder.

In a mesial section of the pelvis the urethra appears as a slit nearly straight, or, as some authors describe it, with a slight sigmoid curve corresponding to that of the posterior vaginal wall.¹ Its course is

FIG. 59.



Frozen Section of the Pelvis, showing contracted bladder and relations of urethra: *a*, anus; *b*, vagina; *c*, bladder; *d*, uterus; *e*, bottom of Douglas's pouch; *f*, symphysis pubis (Fürst).

upward and backward, being "parallel with the plane of the pelvic brim." Henle states that in cross-sections the canal is represented by a transverse slit near its vesical end, while at other points, except at the meatus, the section has a stellate appearance. The average length of the urethra is one and three-eighths inches, the average diameter a quarter of an inch. For the sake of convenience we may consider first the beginning of the canal, then the portion that lies between its two openings, and lastly the vesical extremity.

When in a state of rest the meatus appears as a small dimple, or puckering, of the mucous membrane, situated in the median line at the lower edge of the vestibule, from three-fourths to four-fifths of an inch below the clitoris and an inch in front of the four-

¹ Winckel, *Krankheiten der Weibl. Harnröhre u. Blase*, S. 5.

chette. A cross-section of the canal at this point is represented by a vertical slit. The corrugation of the mucous membrane is not confined to the meatus, but exists throughout the whole course of the urethra when it is not distended. The puckering of the mucosa at the external opening is due to the sphincter action of the muscular fibres which surround it. Around the meatus there will be observed on close inspection several little depressions, which are the openings of the glandulæ vestibulares minores, already alluded to in connection with the vestibule. Just within the meatus are the orifices of a pair of glands described by Dr. Skene.¹ These are simply two of Littre's glands of large size, corresponding to the lacuna major in the fossa navicularis of the penis. They are not always easy to find in the healthy urethra, but in cases of prolapse of the mucous membrane they often stand out prominently. Dr. Skene describes them as tubules, situated just beneath the mucous membrane near the floor of the urethra, and extending upward from the meatus parallel with the canal for a distance of three-quarters of an inch; their function is unknown. They derive a certain pathological interest from the fact that they are sometimes the seat of an inflammatory process, which may long resist treatment until its true site is discovered.

The mucous membrane of the meatus, as well as that of the lower portion of the urinary tract, is covered with pavement epithelium similar to that of the vestibule. The glands (like those near the end of the penis) are lined at their mouths with squamous epithelium, which soon passes into the columnar variety. The venous plexuses around the meatus are apparent even on superficial inspection. The distribution of the vessels and nerves is the same as in other parts of the vestibular area.

The urethra lies beneath the pubic arch, suspended by the pubovesical ligament, and pierces the triangular ligament, to the two layers of which it bears the same relations as the canal in the male. In its anterior three-fourths it is literally imbedded in the anterior vaginal wall, while the upper fourth is intimately connected with the vagina by an intermediate layer of cellular tissue. The fusion of the walls of the two canals results in the formation of the urethro-vaginal septum, which is nearly half an inch in thickness.

ANATOMY.—A. *Gross*.—Three layers of tissue are present in the urethral wall, two of which are muscular and the third mucous. An external layer of cellular tissue is sometimes described, but it is well marked only over the upper portion of the canal. The outer muscular layer consists of smooth fibres disposed in a circular manner around the tube, while those of the internal layer run longitudinally. Uffleman

¹ For details and drawings consult Skene's original article in the *Am. Journ. of Obstetrics*, vol. xiii.

describes a double layer of voluntary muscle (the inner fibres being transverse, the outer longitudinal) which extends from the neck of the bladder to a point halfway to the meatus, below which point it invests only the anterior half of the canal. This muscle is regarded by the writer quoted as a voluntary sphincter. His observations have not been generally confirmed, although Winckel¹ appears to regard them as reliable. Luschka² describes a sphincter muscle common to both the lower end of the urethra and the vaginal orifice. It is a thin muscular band, about six millimeters in breadth, surrounding both the introitus vaginæ and the urethra, and continuous behind with the deep transversus perinei. It serves to compress the urinary canal against the firm urethro-vaginal septum. Another urethral sphincter, known as "Guthrie's muscle," is described by Savage as existing just in front of the sphincter vesicæ, of which it is probably the prolongation.³ By following the circular layers of smooth muscle throughout their entire course, it will be found that it is incomplete over the lower half of the tube, where the fibres blend with those of the vaginal wall. The longitudinal fibres are continuous above with the inner longitudinal layer of the bladder. The mucous membrane, when in a state of rest, is of a pinkish color, and is thrown into longitudinal folds by reason of the large amount of elastic tissue that is contained within it.

B. *Minute*.—In a cross-section of the urethra the following points are to be noted: Exterior to the canal is a plexus of large veins, which are especially abundant at the sides. These are situated in the midst of a mass of loose cellular tissue, which is seen in its true relation to the urethra within the urethro-vaginal septum, where it appears under the microscope as forming a line of separation between the two portions of the septum. Over the anterior wall of the canal its connection is less intimate. The fibres have both a circular and a longitudinal course. Internal to the cellular layer are the longitudinal muscular fibres, which are recognized by the fact that their spindle-cells are divided longitudinally. Between the two muscular layers, and serving to unite them, is a venous plexus enclosed in loose connective tissue. In the transverse muscular layer the fibres run in several directions, not all of them being disposed in a circular manner, so that the fibre-cells will be divided in different planes. Internal to the muscular coat is a thick submucous layer consisting of fibrous and elastic tissue, and containing a plexus of large veins, some of which are really sinuses; so that this tissue may be regarded as analogous in its character to the corpus cavernosum of the penis. From the submucosa elastic fibres extend into the mucous membrane, and numerous papillæ are formed, as in other mucous tracts, by projections of fibrous tissue from the subjacent layer,

¹ *Op. cit.*, p. 6.

² *Anat. des Mensch. Beckens.*

³ See Guthrie, *Anatomy and Diseases of the Genito-urinary Organs.*

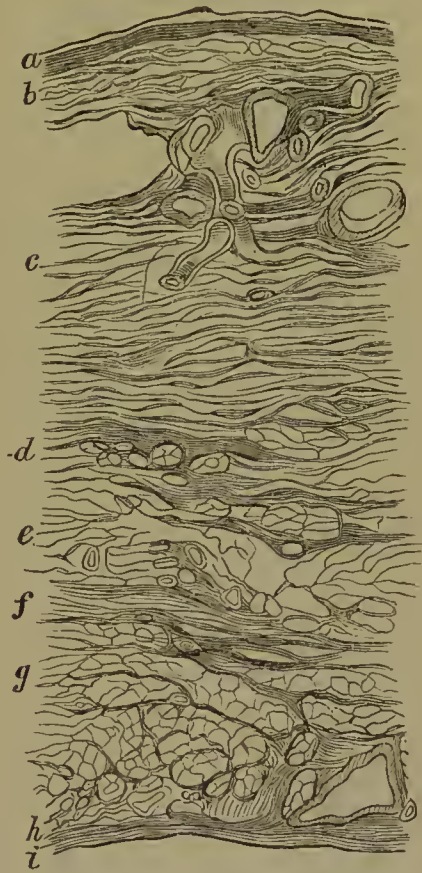
which are covered by epithelium and contain loops of capillaries. The mucous lining of the urethra is rich in elastic fibres, and is quite vascular. The epithelium covering its upper portion is of the so-called transitional type, like that of the bladder; that is, it consists of a superficial layer of columnar cells resting upon a layer of cubical epithelium, and this on one of round cells. Near the orifice the cells become squamous, closely resembling those of the vagina, except that they are somewhat smaller. At the meatus they pass into the larger squamous variety. In addition to the papillæ numerous glands are scattered throughout the mucous membrane, as well as lacunæ, the latter being surrounded near the meatus by villous tufts. The glands are lined by columnar epithelium, while the lacunæ have a partial lining of squamous cells near their mouths; the latter become columnar at a short distance from the free surface. Attention should be called to the presence of collections of lymph-corpuseles within the mucous membrane, which give to it in some places almost the appearance of adenoid tissue.¹

A separate description of the minute anatomy of the septum is hardly necessary. The intimate relation between the walls of the

two canals can be better appreciated by a study of the accompanying figure than by a detailed statement of the anatomy of the parts, to which reference has already been made.

The vesical opening of the urethra is situated about four-fifths of an inch below, or behind, the middle of the symphysis pubis and an inch and a quarter from the cervix uteri, and will be described in connection with the bladder. Henle states that a cross-section of the canal at this point presents the appearance of a transverse slit, Simon and Winckel claim that it is diagonal, Holden that the opening is infundibular,

FIG. 60.



Horizontal Section of the Vesico-vaginal Septum (Henle): *a*, vesical epithelium; *b*, submucosa; *c*, layer of circular fibres; *d*, layer of longitudinal fibres; *e*, loose cellular tissue; *f*, layer of circular fibres; *g*, longitudinal layer; *h*, submucosa; *i*, vaginal epithelium.

¹ Satterthwaite, *op. cit.*, p. 242.

while Savage figures the same as triangular. The determination of this point in the living subject is obviously extremely difficult, if not impossible, and is of no consequence from a practical standpoint. The longitudinal folds in the mucous membrane are especially marked at this extremity of the canal.¹

BLADDER.

SYNONYMS.—*Gr.*, κύστις; *Lat.*, vesica urinaria; *Fr.*, vessie; *Ger.*, Harnblase; *It.*, vescica; *Sp.*, vejiga.

DEFINITION.—A hollow muscular organ, situated in the anterior part of the pelvis, between the symphysis pubis in front and the vagina and uterus behind.

In the living subject the shape of the bladder is constantly changing as it is filled and emptied, so that it is not easy to state what its normal dimensions are. Its shape and size vary at different ages. In infancy it approaches the masculine type, the vertical diameter being the longer, in the mature female the transverse diameter is the greater, while in the senile state there is a return to the infantile condition. When empty the viscus appears as a collapsed sac, which lies behind the pubes and is partially concealed by the fundus uteri. As it becomes distended with urine it gradually rises from behind the symphysis, appearing as an ovoidal body, that pushes upward the fundus of the uterus and fills the anterior pelvic segment. The usual shape of the empty bladder, as viewed in mesial sections of frozen bodies, is that of the letter Y, the vertical leg of which is formed by the urethra, while the oblique legs may be of equal length, or the posterior one the longer (Hart). Hart and Barbour have also figured a mesial section of the empty bladder in which that viscus is represented as of an oval shape, the latter probably representing the bladder in a condition of systole. In the living subject the contracted organ is more nearly round: this is ascribed by Savage to its inherent tonicity. Except during the act of urination the bladder is flaccid and possesses no definite shape. When moderately distended it becomes round; when fully distended, transversely oval. According to Henle and Luschka, the bladder of the female is smaller than that of the male, though others affirm that it is capable of greater distension. Unlike the male organ, its transverse diameter is larger than the vertical (Fig. 61).

ANATOMY.—A. *Gross.*—The bladder is divided into three regions—the body, base or fundus, and neck. The former is defined by Skene as “all that portion of the organ lying above an imaginary line drawn from the ureteric openings to the centre of the symphysis pubis.”

¹ For other details *vide* Blum, “Des Affections de l’Urèthre chez la Femme,” *Arch. gén. de Méd.*, 1877, vol. ii.

The portion below this plane is the fundus or base, which includes the trigone, or the triangular space between the urethral and ureteric openings, and the bas fond, or part of the fundus behind the openings of the ureters. The latter may even be a deep pouch, especially in old subjects. The thickened portion around the urethral orifice is the neck; it is the most dependent part of the organ when the body is erect.

The boundaries of the different regions are clearly recognized only by examining the interior of the bladder. The most prominent landmark is the vesical orifice, which forms the apex of the trigone, where the mucous membrane is thrown into longitudinal folds. The uvula, a distinct elevation at the apex of the triangle in the male bladder, is only faintly marked in the female. The base of this area is formed by an imaginary line joining the openings of the ureters, which appear as small slits distant from each other and from the urethral orifice about an inch and a half, so that the triangle is equilateral. It is smaller than the corresponding region in the male bladder, and is not so clearly defined.

The bladder is essentially a muscular organ. Its wall, which varies in thickness from one-sixth to one-half an inch, according to the degree of distension (Savage), consists of two layers of muscle with the usual mucous lining. The exterior of the viscus is partially covered by peritoneum, as will be explained subsequently. This muscular coat consists of an outer longitudinal and an inner circular stratum, but a distinct separation of the two is not possible, as the fibres interlace in an intricate manner. The longitudinal fibres (of the unstriped variety), which are beautifully shown when the fully-distended bladder is held before a light, are mostly confined to the anterior and posterior aspects. They may be traced from the vesical neck and pubes in front (where they are called the *museuli pubo-vesicales*) over the anterior surface of the organ to the summit, whence a few fibres extend over the nuchus, and then downward over the posterior to the under surface of the neck, where they blend with the anterior vaginal wall. At the sides this layer is represented by a few pale interlacing fibres (Fig. 61).

The circular fibres are best developed around the vesical orifice, where they form the sphincter vesicæ.¹ Their transverse direction is only maintained in the region of the fundus, especially at the trigone, while above this point they cross one another in an oblique manner. Ellis² describes and "figures a submucous stratum," consisting of a thin layer of smooth muscle, the fibres of which run in a longitudinal direction over the lower third of the bladder, and extend for some distance along the urethra. In the upper two-thirds this layer is represented by a few

¹ Hienle (*op. cit.*) denies this function to these fibres.

² *Demonstrations of Anatomy*, p. 574.

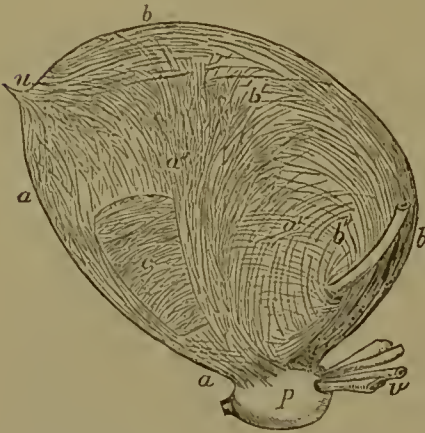
oblique fibres.¹ Between the muscular and mucous coats there is a layer of fibrous and elastic tissue.

The mucous membrane of the empty bladder is thrown into numerous folds by reason of its loose attachment to the underlying tissue, except at the trigone, where it is thinner than at other points, and is more intimately connected with the submucous layer. Its color has been variously described. As viewed through the endoscope in the living subject, it has always appeared to the writer to present a pinkish or rosy hue. Shortly after death it assumes a slaty color, with here and there pinkish areas due to localized hyperæmia. The mucosa is directly continuous with that lining the urethra and ureters; around the openings of these canals it is more firmly adherent than elsewhere.

B. *Minute*.—The mucous membrane is the chief object of interest

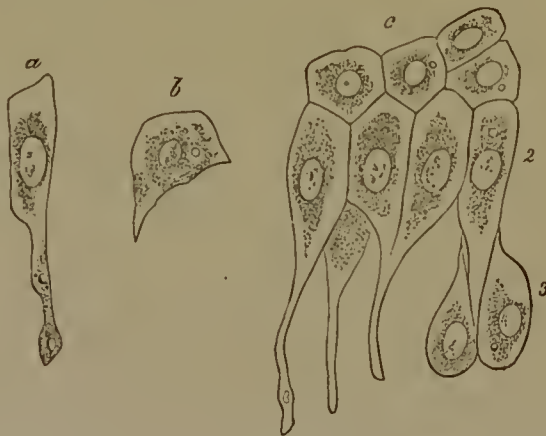
microscopically, the muscular layers presenting the same appearances as in other hollow organs, except that their division into separate strata is less distinct than usual. Klein² instances the bladder as an organ in

FIG. 61.



Muscular Fibres of the Bladder, lateral view (Allen Thompson): *a, a', a''*, decussating longitudinal fibres; *b, b'*, diverging fibres; *b''*, divergent fibres surrounding entrance of ureter; *c*, deep layer of circular fibres.

FIG. 62.



Epithelium of the Bladder (Obersteiner): *a*, cell from the second layer; *b*, cell from the superficial layer; *c*, the three layers as seen in vertical section.

which the bundles of fibres form plexuses. This membrane is supported by the submucous stratum, which is composed of bundles of

¹ For further details *vide Royal Med.-Chir. Transactions* for 1856.

² *Op. cit.*, p. 64.

fibrous and elastic tissue, in the meshes of which are networks of vessels and a limited number of lymphatics and nerve-plexuses, including ganglia. Nerve-fibres are also visible throughout the muscular coat and just beneath the peritoneum. The epithelial lining of the bladder consists of three or more layers of cells resting upon a *membrana propria*, and presenting a typical example of the "transitional" type (Fig. 62). The superficial cells are squamous (but smaller than those of the vagina); the inferior layer consists of columnar epithelia with long processes, and the middle of pyriform cells. Over the trigone the mucosa is thinner and more intimately related to the submucous stratum. The mucous membrane contains a rich plexus of fine capillaries and nerve-fibres, the latter being most numerous in the region of the trigone; they have been traced as far as the cells, but the exact manner of their termination is obscure. The lymphatic supply of the tissue is poor. Sections of the vesical wall in the region of the urethral opening show that the mucosa is thicker here than at other points, so that it may form, as Hart and Barbour suggest, the real barrier to the escape of urine. The uvula is formed by a localized thickening of the submucosa. Savage maintained that there are neither villi nor glands in the lining membrane of the bladder. The former are certainly absent, but later investigations have demonstrated beyond a doubt the existence of small lacunæ and racemose mucous glands lined with cylindrical epithelium, the latter being most numerous near the neck of the bladder.

The organ derives its vascular supply from the anterior division of the internal iliac artery, through the medium of the three vesical branches and a branch from the uterine. These vessels anastomose freely.

The arterial supply of the urethra is received from the branches that are distributed to the anterior vaginal wall. The vaginal artery sends a twig to the region around the vesical neck. The venous plexuses are large and intricate; they cover the exterior of the organ lying outside of the muscular coat, and are largest around the base and neck. The latter plexuses communicate with those of the uterus, vagina, nymphæ, and rectum, and empty into the internal iliac vein. The urethra has its own venous plexus, which is intimately related to the vaginal veins.

The lymphatics from the submucous stratum and exterior of the bladder accompany the veins, and finally enter the glands near the internal iliac artery. The nerves belong to both the sympathetic and cerebro-spinal systems, the former being derived from the hypogastric plexus, and supplying the bladder in common with the other pelvic organs. The latter nerves are branches of the third and fourth sacral, and are distributed mainly around the base and neck.

RELATIONS AND ATTACHMENTS.—Anteriorly the bladder is separated from the posterior surface of the symphysis pubis by the retro-

pubic fat, which latter tissue assumes a triangular shape when the viscus is empty. The anterior surface of the organ is entirely devoid of peritoneum; as it rises above the pubes it approaches closely to the anterior abdominal wall. The summit of the bladder and a portion of the posterior wall are covered by peritoneum. The former is only in contact with coils of small intestine when the organ rises out of the pelvis; under normal conditions the vesico-uterine pouch does not contain intestine. As the bladder becomes empty the uterus inclines forward, resting upon—or, more correctly, over—the summit, while the coils of small intestine glide backward. Below the level of the os internum the peritoneal investment of the posterior wall is wanting, and the latter is united to the upper part of the anterior vaginal wall by means of an intervening layer of dense fibrous tissue.

The neck of the bladder and the upper fourth of the urethra have the same attachment to the vaginal wall, the entire thickness of the tissue separating the cavities of the bladder and vagina being known as the vesico-vaginal septum. Above the upper limit of the septum is a subperitoneal space, intervening between the posterior vesical wall and the cervix uteri; this is filled with a small quantity of loose cellular tissue. The round ligaments cross the lateral walls of the bladder, while above and behind the summit are the broad ligaments with their contents.

The relations of the ureters will be described later. The so-called true and false ligaments will be mentioned under the sections treating of the pelvic connective tissue and peritoneum, of which they form parts. The attachments of the urachus and obliterated hypogastric arteries are the same as in the male bladder.

Ureters.—Their course previous to entering the pelvis is the same as in the male. Their relations within the pelvis have been studied with great care in connection with the obstetrical operation known as gastro-clytrotomy.¹ In the non-pregnant woman they are nearly parallel in the upper part of their course until they cross the iliac arteries (the left ureter lying behind the sigmoid flexure, the right behind the lower end of the ilcum), when they extend downward, backward, and outward along the lateral walls of the pelvis until near the spine of the ischium, where they bend downward, forward, and inward behind the uterine vessels. Passing beneath the bases of the broad ligaments, they converge behind the cervix uteri, and enter the bladder from one-half to three-quarters of an inch in front of, and below, it. The distance between the two ureters just as they reach the bladder is about two inches. They run in the muscular coat of that organ

¹ Garrigues and Polk have investigated this subject quite thoroughly. Comp. Garrigues's papers in *Am. Journ. Obstet.*, Jan., 1883; *N. Y. Med. Journ.*, Oct. and Nov., 1878; and Polk's in the *N. Y. Med. Journ.*, May, 1882, and *Am. Journ. Obstet.*, Jan., 1883.

for a distance of a little more than half an inch, still converging, so that their internal openings are separated from each other by only an inch or an inch and a half, and from the anterior lip of the cervix by a space of three-quarters of an inch. Just before entering the bladder they lie in the mass of cellular tissue which is immediately above the lateral walls of the vagina. As each ureter pierces the muscular coat of the bladder its circular fibres blend with those of the inner or circular layer, while the longitudinal are prolonged inward to meet those of the opposite side, forming the "inter-ureteric ligament" of Juerié, which is represented by a transverse ridge extending between the ureteric openings and constituting the base of the vesical triangle. The slit-like orifices of the ureters are protected by valvular folds of mucous membrane. Two faintly-marked bundles of smooth muscular fibres (rudimentary in the female) have been described as arising from the so-called vesical sphincter, and passing beneath the base, to be attached near the terminations of the ureters. The function of these muscles, as well as of the interureteric band, seems to be to close the orifices of those tubes by drawing upon them, thus preventing regurgitation during the act of urination.

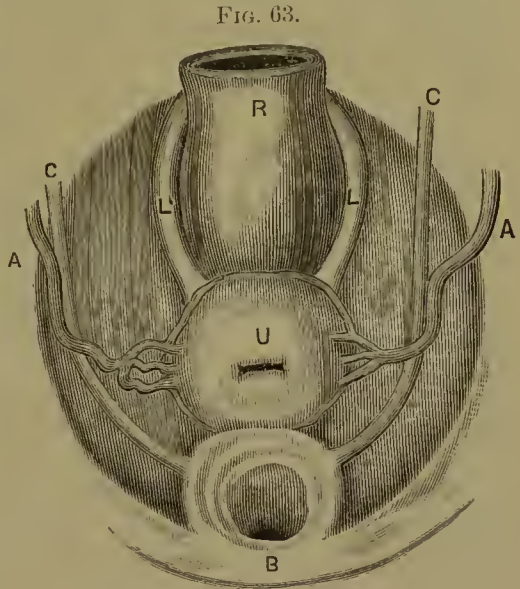


FIG. 63.
Relations of the Ureters at the level of the os internum as seen from above (Polk): U, uterus; B, bladder; R, rectum; A, A, uterine arteries; C, C, ureters; L, L, utero-sacral ligaments.

The relations of the ureters in the pregnant woman are slightly different from those in the non-pregnant, the differences being thus summarized by Polk,¹ who has made a special study of the subject: "As a whole, the tubes in the pelvis are situated upon a higher plane than in the non-pregnant condition, having been carried slightly upward, while being separated from their close relations with the pelvic wall by the ascending uterine tubes."² The gross and microscopical anatomy of these canals does not require a separate description.

PRACTICAL DEDUCTIONS.—The condition of the bladder is too often disregarded during an examination of the female pelvic organs,

¹ *N. Y. Med. Journ.*, May, 1882.

² See also Luschka, "Topographie d. Harnleiter d. Weibes," *Arch. für Gyn.*, iii, 1872, p. 373.

although the symptoms referable to this organ are among the most common and distressing of which women complain. There is such a radical difference between the urethro-vesical tract in the sexes, as regards both its anatomy and pathology, that the reader should not seek to draw comparisons. To infer that a woman has acute cystitis because she has symptoms ordinarily accompanying that disease in the male would imply a complete ignorance of the anatomy and physics of the pelvis.

Let the reader bear in mind the cardinal fact that "the uterus and bladder behave practically as one organ," so far as concerns changes in position; in other words, that the base of the bladder is so firmly united to the uterus that any displacement of the latter will cause traction upon the former at its point of attachment to the pubes—*i. e.* the neck. Thus is explained the vesical irritation (frequent and painful micturition) so common in acquired antelexion, where the traction exerted along the line of the utero-sacral ligaments is transmitted from their uterine attachment to the neck of the bladder. In this way a remote retro-uterine inflammation may directly effect the bladder, causing a permanent disturbance of its functions, while the organ itself remains free from disease. This is more in accord with anatomical facts than the theory that frequent micturition in cases of ante-displacement is due to the pressure of the fundus uteri on the bladder. The effects of backward displacement upon the bladder are best observed in retroflexion of the gravid uterus, when the neck of the former organ may be so compressed between the cervix and the pubes that retention and all its serious consequences may result.

Aside from the physiological elevation of the bladder during pregnancy, the organ is sometimes drawn upward by a fibroid uterus, or ovarian cyst, in such a manner that it might easily be wounded by the laparotomist. The introduction of a sound as a guide is the only safeguard. This precaution is indispensable during the separation of the bladder from the uterus in vaginal extirpation, a delicate procedure requiring both time and patience. Perforation of the vesical wall can only be avoided by keeping close to the uterus. The proximity of the bladder to the organs occupying the anterior pelvic fossa has suggested the practice of the vesical touch, in which the finger is introduced through the dilated urethra.

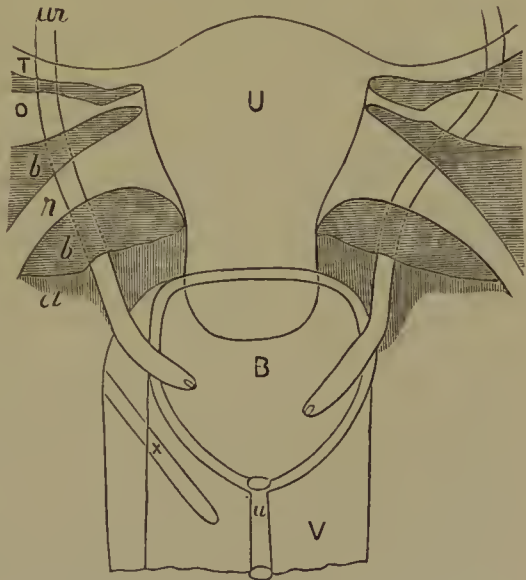
That portion of the posterior wall of the viscus which enters into the formation of the vesico-vaginal septum is most interesting surgically, since it is the usual site of fistula and is the region in which artificial openings are made into the bladder for the removal of calculi, foreign bodies, or morbid growths, the relief of chronic cystitis, etc. This portion of the bladder is, of course, not covered by peritoneum. Cystocoele also occurs in this locality from obvious causes. Retention

of urine in the pouch thus formed may lead to cystitis or to the formation of calculi. It will occur to the reader that, by advising a patient to urinate on the hands and knees, gravity will assist in emptying this pouch. There can be no excuse for dragging a large calculus through a dilated urethra, at the risk of causing permanent incontinence, when it can be removed so easily and safely through an incision in the septum. Surgical wounds of the septum heal so rapidly that it is difficult to maintain a permanent opening after cystotomy, unless the opening is made with the thermo-cautery or by Emmet's method.

From what has been said regarding the course of the ureters just before entering the bladder, it will be inferred that transverse incisions through the septum should be avoided, median longitudinal ones being safer. As the mucous membrane of the vagina is loose and movable, we can only avoid making an irregular or valvular opening by cutting down directly upon the end of a sound, which presses forward the septum at the exact point at which it is proposed to establish the fistula. The ureters may be included in a large fistula, and one or both of their openings can be seen in the everted vesical mucosa; it must then be exceedingly difficult to avoid including them in the sutures at the time of operation. Uretero-vaginal fistulæ are rarely formed in the fornix; communications between a ureter and the uterine cavity are still more uncommon.

The operation of catheterization of the ureters possesses no practical interest for the general reader. In complete extirpation of the uterus the operator avoids these ducts by keeping close to the cervix; in gastro-elytrotomy it is generally acknowledged that the vagina should be opened above the line at which it is crossed by the ureter. From the limited space which exists for the incision in the latter operation, it is evident that the tear may readily involve the bladder; which is, in fact, a common accident. Fortunately, wounds of this viscous (especially at its fundus) heal quickly.

FIG. 65.



Surgical Relations of the Ureters (Garrigues): *U*, uterus; *B*, bladder; *ur*, ureter; *u*, urethra; *V*, vagina, with *x*, showing line of incision in gastro-elytrotomy; *T*, Fallopian tube; *O*, ovary; *b*, broad ligament; *r*, round ligament; *ct*, connective tissue.

Since endoscopy has become popular we have been able to study

thoroughly the normal mucous membrane of the bladder, and consequently to distinguish more definitely the changes in its color due to disease. It may be stated in general, with regard to inflammation of the female bladder, that it is capable of being diagnosticated more directly (by palpation through the vagina, etc.), and that local treatment by means of irrigation, permanent catheterization, and surgical interference is more practicable, than in the male. Intractable as are many cases of chronic cystitis, it would seem as if suppuration and renal complications should be of rare occurrence when the gynecologist can at any time establish perfect drainage through an artificial fistula, and thus also apply his remedies directly to the diseased mucosa. Our study of the pelvic nerves has shown us that the innervation of the genital and urinary tracts is practically the same. We have seen that certain affections of the other pelvic organs may cause irritation of the bladder, and conversely. The sphincter vesicæ being especially sensitive to these reflex influences, we need not wonder that incontinence and retention may result from distant causes.

The frequent extension of malignant disease of the cervix to the bladder, and the ultimate uræmic complications which may result, are well known.

The female urethra differs from that of the male in its shortness, its dilatability, and its comparative immobility. The first two peculiarities tempt the gynecologist to enlarge the canal for the convenient practice of manipulations within the bladder, while the last suggests a danger from over-dilatation, which is not imaginary. Although there is a wide difference of opinion as to the liability to persistent incontinence after dilatation of this canal, for the purpose either of introducing the fingers or of extracting a foreign body, a careful study of its anatomy must convince the reader that this procedure is not so harmless as it has been represented. Emmet, in the light of his great clinical experience, strongly condemns it. In some instances clumsy efforts to extract calculi have resulted in laceration of the urethra. Dr. Emmet believes that this laceration is usually transverse, and is situated in front of the subpubic ligament; to repair the injury requires exceptional skill in plastic surgery. Urethrocele is believed by the same writer to be also due to mechanical injury to the canal, whereby its natural supports are weakened. The prolonged compression of the urethral tissues between the pubes and the impacted foetal head is no slight cause of lesions. The most important surgical operation in this region is the formation of a "buttonhole," after Emmet's method.

At the meatus Skene's glands possess a practical interest, from the inflammation to which they are subject; this inflammation, though localized, is very obstinate, and can be cured only by treatment directed to the glands themselves.

We need not dwell upon the little operation of passing the catheter. Easy as it appears from the description, when the bladder is drawn upward, or compressed by morbid growths, or the urethra is encroached upon by a large fœtal head, it often tests both the skill and the anatomical knowledge of the physician. Nothing will be gained by force; the length and direction of the canal must be remembered, and the catheter must be guided accordingly. It would hardly seem necessary to add the caution that the female bladder is peculiarly liable to receive infection from unclean instruments, and that the resulting cystitis is often extremely intractable.

RECTUM.

SYNONYMS.—*Lat.*, rectum; *Fr.*, rectum; *Ger.*, Mastdarm; *It.*, retto; *Sp.*, recto.

DEFINITION.—The rectum is the lower extremity of the large intestine and the termination of the intestinal tract.

The rectum of the female, although it is not so intimately connected with the genital organs as the urinary tract, and is not the seat of as many affections which directly concern the gynecologist, nevertheless deserves careful mention because of the relation which it bears to the pelvic contents. It is not enough for the specialist and general practitioner to become thoroughly acquainted with these relations from an anatomical standpoint; he must also be familiar with the “feel” of those organs which can be touched through the anterior rectal wall.

The rectum begins near the left sacro-iliac synchondrosis, extends downward and backward, and at the same time toward the median line of the body, until it reaches a point opposite to the third sacral vertebra, when it curves downward and forward behind the cervix uteri to meet the vagina, the course of which canal it follows, finally making a sharp bend backward to its termination. It thus appears that the rectum presents three separate curves, the first being from left to right, the second forward, and the third directly backward.¹

The reader must be cautioned against regarding the rectum as an open canal, as it is figured in many textbooks. A careful study of frozen sections, as well as observations made on the living subject, prove that, unless distended by the presence of some foreign body, it is, like the canals of the genito-urinary system, simply a slit, and, moreover, that during life the anus is never patent under normal conditions, except when by the relaxation of the sphincter it opens to allow the passage of feces.

¹ The direction of the anal canal is thus given by Hart and Barbour (*op. cit.*), who base their statement upon studies of frozen sections. The writer is inclined to believe, with Ranney, that this direction is more nearly vertical.

ANATOMY.—A. *Gross*.—The rectum in the female is about eight inches in length, and is somewhat less curved than in the male, its calibre being usually greater. Externally it is smooth, non-sacculated, and is destitute of the longitudinal muscular bands which are the prominent characteristics of the colon. Although the lower four inches of the canal are usually empty, the portion just above the anus is capable of great distension, and has in consequence been called the “ampulla.” When hyper-distended by artificial means the rectum appears to taper gradually from the ampulla to the upper end, which is the narrowest part next to the anus¹ (Fig. 65).



Rectum Inflated (Chadwick): a, b, sphincter tertius; c, ampulla.

The anal orifice is very dilatable; the anus itself is not a mere aperture, but a canal, extending through the entire thickness of the integument and muscles forming the pelvic floor. The skin around the external opening is thrown into a number of radiating folds, caused by the contraction of the sphincter, is deeply pigmented, and is covered with hair and sebaceous glands.

On exposing the interior of the rectum by an incision carried through the entire length of the anterior wall, a number of folds will be observed in the mucous lining. Those near the anus have mostly a longitudinal direction, and are known as the “columns of Morgagni,” the depressions between them being called the “sinuses of Morgagni;” they are said to be corrugations of the mucous membrane due to the contraction of the sphincter, and they nearly all disappear when the gut is distended. Higher up in the bowel are various circular and oblique folds. Three of the latter variety are permanent; they include a portion of the muscular as well as the mucous stratum, and are about half an inch in depth. One of these projects from the anterior wall at a distance of an inch and a half from the anus,² another is on the right side of the canal, on a level with the sacral promontory, while a third is situated midway between the two on the left side.

The lowest fold has been called “the valve of Houston,” while Hyrtl has described it under the name of sphincter ani tertius. The so-called

¹ Vide Chadwick, “The Function of the Anal Sphincters,” *Trans. Am. Gyn. Soc.*, vol. ii. p. 43.

² Ellis (*op. cit.*, p. 583) says that it is “three inches from the anus, on the front of the rectum, opposite the base of the bladder.”

“third sphincter of the rectum” is a structure which has received no small amount of attention—more, in fact, than it quite deserves. There has been much controversy regarding its location, appearance, and function. All authorities agree that folds and constrictions do exist within the rectum, but they differ widely as to the number of folds and the exact situation of those which form the third sphincter. Chadwick¹ describes and figures it as consisting of two crescentic rugæ, one of which is in the anterior wall (corresponding with the lowest valve of Houston), while the other is an inch higher up in the posterior wall. The writer has seen the upper fold so prominent that it was mistaken for a stricture. On the other hand, he has met with folds in the mucous membrane at a distance of three or four inches from the anus so large that they arrested a rectal tube, but when the patient was examined under ether, the canal being exposed with a Sims speculum, they had entirely disappeared.² An extended discussion of this matter would be out of place here. It is enough to state that the sphincter in question is not, as its name suggests, a band encircling the gut, but a succession of valve-like folds situated at different levels and acting together to cause a certain amount of constriction of the canal.

The coats of the rectum are three in number. Like the bladder, it has only a partial peritoneal investment, the disposition of which will be mentioned subsequently. The muscular coat includes two layers of unstriped muscle—a superficial, which consists of longitudinal fibres similar to those in the colon, but distributed uniformly around the gut instead of being collected in separate bands, and a deep layer of circular fibres. The latter are best marked immediately above the anus, where they form a distinct ring nearly half an inch in width (internal sphincter). The submucous layer is common to the intestine. The mucous lining is thicker and more movable than that of the colon, and, by reason of its vascularity, generally appears of a bright pink, or even red, color.

Certain muscles are attached to the lower end of the rectum. Of these the levatores ani are especially important, as forming an essential part of the pelvic floor; they will be described in connection with that structure. The external sphincter is a thin, pale, elliptical voluntary muscle which surrounds the anal canal, having posteriorly a fibrous attachment to the coccyx, while anteriorly it is inserted into the perineal centre, where it appears to blend with the sphincter vaginae. Dr. Emmet has recently stated that the opposite fibres of the sphincter do *not* interlace in front of the anus, but run parallel to each other up to their point of insertion, being simply kept in apposition by transverse

¹ *Op. cit.*

² For an able article on this subject by Kelsey the reader is referred to the *N. Y. Med. Journal* for March, 1881.

bands of fibrous tissue.¹ Although this opinion seems to be supported by many of the figures in anatomical works, the writer has not been able to satisfy himself by his own dissections of its absolute correctness. The relations of the sphincter to the perineal body belong properly to the section which treats of that subject. Ellis also describes a delicate

FIG. 66.



Vertical Section through Lower End of Rectum (Ruedinger): 1, rectal mucous membrane; 2, line of separation between mucous membrane and skin of buttock; 3, fat; 4, levator ani; 5, 6, external sphincter; 7, internal sphincter; 8, 9, longitudinal muscular fibres interlacing with those of sphincter; 10, terminations of longitudinal fibres; 11, circular fibres; 12, 13, longitudinal fibres of musculus rectalis.

subcutaneous layer of involuntary muscle that “surrounds the anus with radiating fibres” (*corrugator cutis ani*).

B. *Minute*.—The muscular coat offers nothing of particular interest microscopically, except near the anus, where the longitudinal fibres

¹ A laceration of the perineum through the sphincter involves, according to some writers, simply a separation of the opposite halves of the muscle, and not an actual laceration of its fibres.

interlace with those of the sphincters and end just beneath the integument of the anal region.

The minute anatomy of the mucous membrane is similar to that of the colon. It is lined by columnar epithelium and contains numbers of Lieberkühn's follicles. Hermann and Desfosses have described convoluted glands which open on the free surface near the anus.¹ There is a transition at the anus from columnar to stratified pavement epithelium. The so-called "white line" marks the lower limit of the mucous membrane.

The vascular supply of the rectum is very abundant. The branches of the three hemorrhoidal arteries (of which the superior arises from the inferior mesenteric, the middle generally from the internal iliac, and the inferior from the pudic) penetrate the muscular coat in the upper half of the canal, and form a network in the submucous layer; over the lower half they run downward parallel to one another, and to the long axis of the bowel, as far as the anus, where they are united by transverse branches.² The veins form a dense plexus (hemorrhoidal plexus) in the submucosa, which communicates with another plexus exterior to the gut, and empties into those veins that accompany the corresponding arteries. These enter both the portal and general venous systems, the superior hemorrhoidal being a branch of the inferior mesenteric vein, while the middle and inferior hemorrhoidal veins empty into the internal iliac. The lymphatics form two intercommunicating plexuses, one in the submucosa, and the other beneath the peritoneum and in the superficial muscular stratum. In the anal region they communicate with those of the integument. They all pass through the glands of the mesorectum to terminate in the sacral glands. The sympathetic nerves are derived mostly from the hypogastric plexuses, those of the cerebro-spinal system from the sacral plexus.

RELATIONS AND ATTACHMENTS.—The upper portion of the rectum, which is covered by peritoneum, is in direct relation anteriorly with the pouch of Douglas; the utero-sacral folds, that form the lateral boundaries of the pouch, pass on each side of the rectum to reach the sacrum. When the bladder is empty and the uterus inclines forward, the anterior rectal wall will be in contact with the loops of small intestine which fill the fossa. As the uterus rises toward the vertical the small intestine is displaced upward, and the rectum and uterus are only separated by a narrow space, in which is a double fold of peritoneum. If the rectum is much distended, or the uterus has a considerable range of mobility, the two may be in contact, especially when the woman is in the recumbent posture. On the left side of this portion of the rectum lie the ureter and some branches of the internal iliac artery. Behind it is a fold of peritoneum (mesorectum) which attaches it to the sacrum,

¹ *Compt. rend.*, xc., 1880.

² Quain's *Anatomy* (9th ed.), vol. ii. p. 619.

against which bone it lies ; it rests also upon the left pyriformis muscle and sacral plexus.

The sacral portion of the rectum, or that part which lies within the hollow of the sacrum, gradually loses its peritoneal covering, first behind, then at the sides, and finally in front. It is in relation anteriorly at first with the bottom of Douglas's pouch, which intervenes between it and the upper end of the posterior vaginal wall ; but at a point about three inches from the ostium the peritoneum is reflected from the rectum, and the latter becomes loosely attached to the vagina as low as an inch and a half from the anus. Here the rectum bends backward and the vagina somewhat forward, so that a triangular interval is left between the lower extremities of the two canals, which is occupied by the perineal body. The septum separating the rectum and vagina where they lie in contact (recto-vaginal septum) is formed by their walls and a quantity of loose areolar tissue enclosing some venous plexuses that serves to connect them. The rectum is attached to the sacrum and coccyx by bands of fibrous tissue containing a quantity of fat. Laterally, it receives the insertions of the levatores ani. The anal canal is in immediate relation anteriorly with the base of the perineal body, and is surrounded above by the external sphincter, and at its termination by integument, beneath which is a layer of adipose tissue.

PRACTICAL DEDUCTIONS.—The principal point of practical interest in the rectum of the female is its relation to the genital organs. By the rectal touch we are enabled to distinguish, more clearly than by the vaginal, retro-uterine tumors, inflammatory conditions of the utero-sacral ligaments, etc. Prolapsed tubes and ovaries and indurations in the broad ligaments can also be touched through the rectal wall. It is often possible to replace a retroverted uterus (and especially the retro-displaced pregnant organ) by pressure exerted through the rectum.

That gynecologists emphasize the fact that habitual constipation is a fruitful source and aggravation of uterine disease, especially of displacements, cannot surprise the reader who considers the relations of the rectum to the genital tract, and the changes in size and position of the latter which result from constant over-distension of the gut. The pain occasioned by the pressure of hardened feces against a sensitive ovary or an acute inflammatory focus can readily be conceived. Rectocele as a result of fecal accumulation is easily understood. The rectum is closely connected with the vagina, so that the two canals share some affections in common ; in fact, disease of the former is sometimes referred by the patient to the latter. Thus rectocele is not, as its name would seem to imply, a prolapse of the rectum alone, but of the anterior rectal and posterior vaginal walls, which have been deprived of their natural support by a tear of the perineal body (and injury to the

pelvic floor?). A minute recto-vaginal fistula may cause an amount of discomfort to the patient entirely out of proportion to its size.

On account of its proximity to the vagina, the lower end of the rectum can readily be examined by introducing one or two fingers into the former canal and everting the rectal mucous membrane through the sphincter. The lower third of the recto-vaginal septum generally shares in laceration of the perineum extending through the sphincter; the hemorrhage at the time of the accident, when the circulation has been obstructed by prolonged pressure of the child's head, is sometimes quite alarming. The reader need only recall the train of consequences which ultimately follows this lesion in order to recognize the propriety of the primary operation for its repair, although it is not always successful. The secondary operation for laceration through the sphincter requires as much skill and judgment as any in gynecology; the difficulty of maintaining perfect apposition of the parts and rest during healing is obvious. From the anatomical structure of the torn sphincter and its constant tendency to contract, it often fails to unite perfectly. The method of closing the tear in the recto-vaginal septum by suturing the rectal and vaginal mucosa separately, and then repairing the perineal rupture, including the sphincter, seems to provide against most of the chances of failure.

Constipation not only favors the development and persistence of uterine disease, but it renders common certain affections that result from obstruction to the venous circulation, especially hemorrhoids. It is in vain to treat these latter until the cause has been sought for and removed. Referring again to the oft-mentioned continuity of the pelvic venous plexuses, the writer need only call attention to the fact that the obstruction of the circulation through the rectal vessels may be situated in some remote portion of the pelvis. If ablation is necessary, the operation is easier than in the male, since the piles are rendered easily accessible by everting them by pressure through the vagina.

The reflex symptoms resulting from rectal disease in the female are best observed in cases of anal fissure. Besides the characteristic pain experienced after defecation, the patient may suffer from vaginismus or vesical disturbance, or may describe symptoms which point to some affections of the internal genital organs. Thorough dilatation of the sphincter will remove a train of evils which appeared as formidable as they were inexplicable. From the close proximity of the anus to the vulva, it follows that certain affections of the latter may readily extend to the former. Thus, pruritus ani, although it may exist independently, often accompanies pruritus vulvæ, while acrid and irritating vaginal discharges, specific or non-specific, flowing downward over the anus while the patient lies upon the back, may cause troubles which are

rarely found in that region in the male (chaneroids, *plaques*, *muquenses*, etc.).

Pelvic abscesses sometimes rupture into the lower bowel, and continue to discharge their contents for months, or even years, especially during defecation. It is manifest that it is not only next to impossible to discover the opening of such an abscess, but to promote healing of the sac, since it is subject to constant disturbance from the passage of the feces. This fact is sufficient to prevent the surgeon from tapping an abscess, ovarian cyst, or hæmatocele through the rectal wall, or from removing a diseased ovary through this channel, the latter being an operation that has never enjoyed much favor.

In addition to the organs contained within the female pelvis, there are certain tissues that invest and support those organs, with the anatomy and relations of which it is important for the gynecologist to be thoroughly acquainted. These are arranged to some extent in layers, and include, as viewed from above downward, the peritoneum, the connective tissue, and the pelvic floor. Each of these will be studied first as a whole, and then in its relations to individual organs. It is assumed that the reader is sufficiently familiar with the bony pelvis through his obstetrical reading to obviate the necessity of introducing even a brief description of it here.

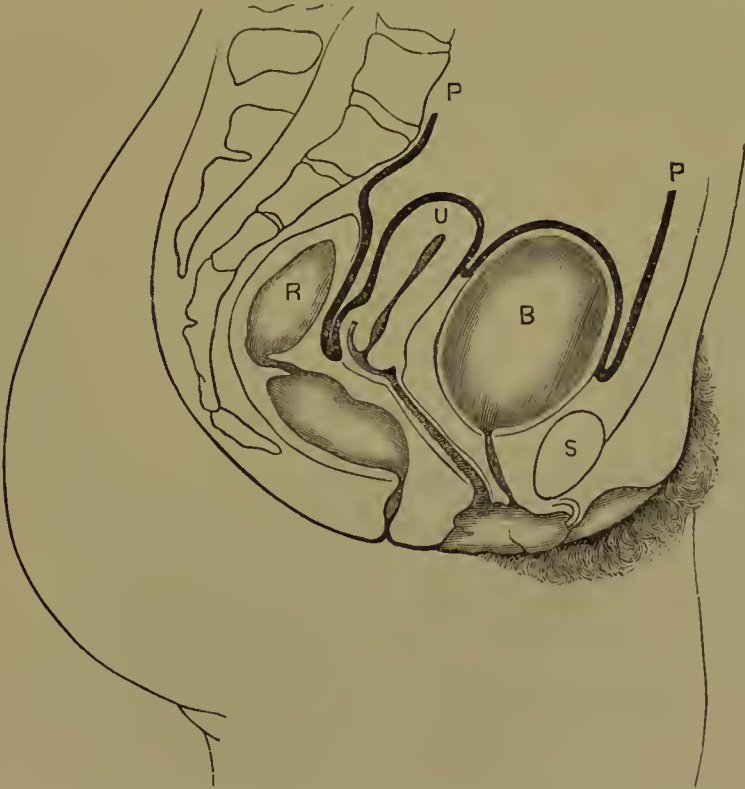
PELVIC PERITONEUM.

As its name implies, this includes that portion of the serous lining of the abdomen which covers the floor of the pelvis and invests more or less completely the contained organs. The peritoneum covering the anterior abdominal wall, as traced in a vertical mesial section at a point an inch or an inch and a half above the upper border of the symphysis pubis, is reflected backward to the fundus of the bladder. Covering the posterior surface of that viscus as low as the level of the internal os (and as much of the lateral surfaces as lies behind the obliterated hypogastric arteries), it crosses over to the anterior surface of the uterus, which it invests, while laterally it extends outward in a plane perpendicular to that of the pelvic brim, to be attached to the lateral wall of the cavity, forming the anterior fold of the broad ligament: having covered the fundus uteri, it descends on the posterior surface of the organ to a point on the vaginal wall about an inch below the utero-vaginal junction, at the same time extending laterally as the posterior lamina of the broad ligament. Finally, it is reflected from the vagina to the anterior surface of the second portion of the rectum, and ascends to the third part, which it surrounds completely (Fig. 67). Above this point it leaves the pelvis, and need not be traced farther.

Besides investing the organs in the manner described, the membrane

lines the lateral walls of the pelvis and dips down to cover the pelvic floor, forming the anterior and posterior fossæ, which are separated by the broad ligaments. The anterior is not so deep as the posterior, since the peritoneum at the sides of the bladder only descends as low as the base of the broad ligament, while behind the uterus it forms the pouch

FIG. 67.



Diagrammatic Representation of the Pelvic Peritoneum, as seen in a mesial section (Ranney):
P, P, peritoneum; *R*, rectum; *U*, uterus; *B*, bladder, distended; *S*, symphysis pubis.

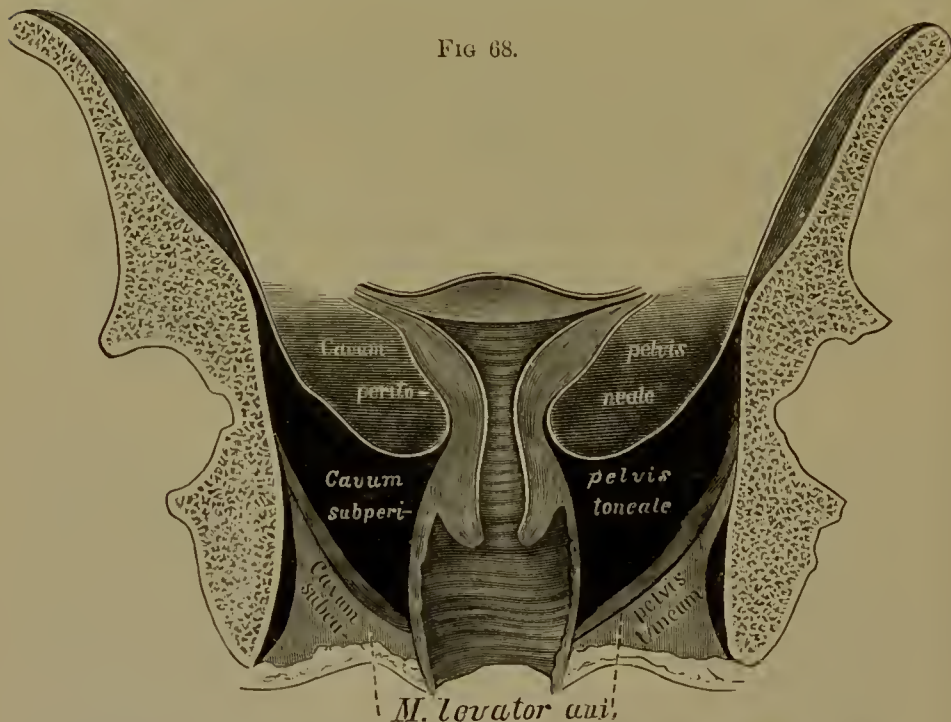
of Douglas, the bottom of which is considerably below this level. Following Luschka's teaching, we may regard the peritoneum as a sort of diaphragm dividing the pelvic cavity into two portions: the one above the peritoneum may be called the peritoneal space, while that which is situated below it (*i. e.* between the peritoneum and the upper surface of the levator ani muscle) is the subperitoneal. The latter contains most of the connective tissue of the pelvis (Fig. 68).

From what has already been said, it will be inferred that portions of the pelvic organs are devoid of a peritoneal investment; all of the organs are really situated in the "cavum pelvis subperitoneale," although the anterior surface of the bladder, the anterior aspect of the cervix, the anterior fornix vaginae, and the lower two-thirds of the rectum are

the uncovered portions that lie in this space. The peritoneum is capable of a considerable amount of distension, so as to accommodate itself to the variable size and position of each organ to which it is attached. Thus it is affirmed by some writers that the lining of the anterior abdominal wall immediately above the symphysis is actually "stripped off" by the bladder as it rises in extreme distension. Less probable is the theory of Josephs, that, as the viscus fills, it deprives the anterior surface of the uterus of a portion of its serous covering.¹

Polk has studied the changes in the relative position of the pelvic peritoneum occasioned by pregnancy.² The principal alteration seems to consist in the elevation of the broad ligaments above the level which

FIG 68.



Cross-section of the Pelvis, showing the Peritoneal and Subperitoneal Cavities (Luschka).

they occupy in the nulliparous woman. Hart and Barbour, reasoning from the appearances seen in frozen sections, maintain that "during parturition the peritoneum is drawn off from the bladder." Savage is sceptical on this point. Without stopping to discuss a matter which is still *sub judice*, it may at least be said that the attachment of the serous membrane to the lower part of the anterior abdominal wall and to the fundus and posterior surface of the bladder is less inti-

¹ "Beitrag zur Ätiologie der Uterus-flexionen auf Grund anatomischer Untersuchung. u. Klin. Beobachtung," *Beitrag zur Geburtsh. und Gynäkologie*, Bd. ii., 1879.

² "Observations upon the Anatomy of the Female Pelvis," *N. Y. Med. Journ.*, Dec., 1882.

mate than elsewhere, so that if a separation or stripping off occurred it would doubtless be at these points. That the uterus is ever deprived of its peritoneal covering is improbable.

The various attachments and folds of the pelvic peritoneum have been described separately under the name of "ligaments" and "pouches." The former term is not a happy one, since the delicate membrane in question seldom if ever has a true ligamentous function, this being assumed by the subperitoneal layer of fibro-muscular tissue which Savage has described as a *platysma musele*. The expression "false ligaments," commonly employed by anatomists in describing the pelvic organs, is in itself an evidence that the peritoneum is not regarded as affording much support to the structures beneath it.

Beginning anteriorly as before, we notice in the median line a narrow fold of peritoneum which extends from the umbilicus along the anterior abdominal wall, and is then reflected along the archus to the fundus of the bladder. This is known as the *ligamentum suspensorium*, or superior false ligament. The folds which extend outward from the sides of the organ constitute the lateral false ligaments. The utero-vesical ligament (or ligaments) includes that portion of the membrane which stretches between the uterus and bladder.

The broad ligaments are the double folds of peritoneum before mentioned, which extend from the sides of the uterus to the lateral walls of the pelvis, dividing that cavity into two parts. They contain the uterine appendages with their vessels and nerves, the vessels and nerves of the uterus, and other important structures, all of which have been described. In order to gain an intelligent idea of the formation and contents of the broad ligaments, the reader should forget for a time the unfortunate term "ligament," and recall the appearance of the mesentery with its two laminae, between which are the vessels and nerves. The conditions are similar: let the Fallopian tube represent a loop of small intestine, and the corresponding broad ligament will be its mesentery. Again: imagine that there is a double layer of membrane stretching across the pelvis, and that the uterus has pushed its way up from beneath and separated the laminae, which are elsewhere closely approximated. And when we remember that each layer of peritoneum, as it becomes folded, carries with it its subperitoneal layer of fibro-muscular tissue, the subject becomes greatly simplified. It is now easy to understand that there must be a space between the laminae in which run the vessels and nerves, so that these are subperitoneal as well as the organs which they supply. When the bladder is empty and the uterus is inclined forward, the broad ligaments run outward and backward, while their planes are tipped in such a manner that their anterior surfaces look downward and forward. The base of each ligament will be represented approximately by a wavy line, convex over its external half, drawn

from the lateral border of the uterus at the level of the os internum outward to a point just in front of the sacro-iliac synchondrosis (Fig. 69).

Its upper margin, corresponding with that of the tube, is slightly concave near the uterus, from the superior angle of which it extends to "a point on the pectineal line, situated in the virgin about midway between the sacro-iliac synchondrosis and the ilio-pectineal eminence." Its inner attachment is along the lateral border of the uterus from the superior angle almost to the lateral fornix of the vagina, from which it is separated by a quantity of loose connective tissue enclosing a venous plexus. The outer edge of the ligament is attached to the pelvic wall "along a line which is situated between the great sacro-

FIG. 69.

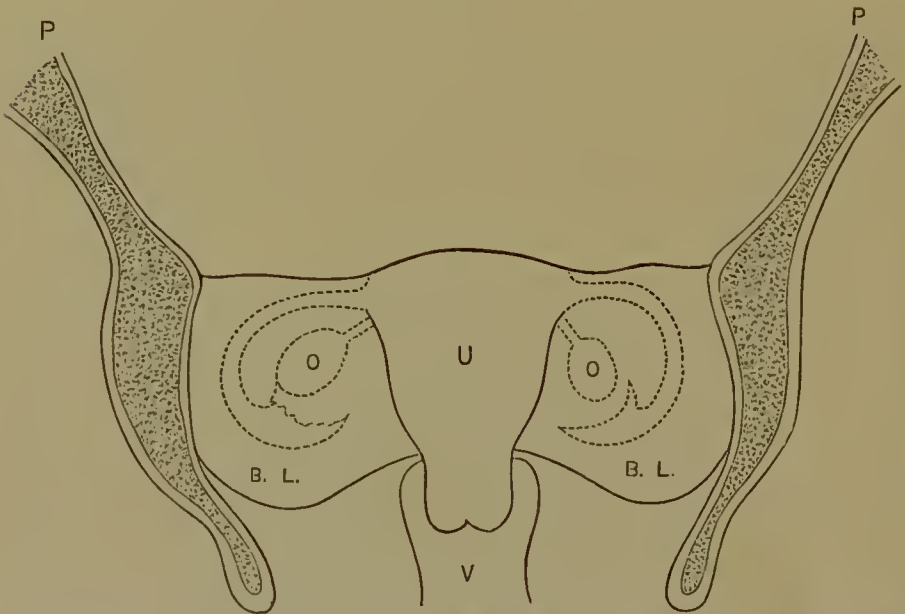


Diagram showing the Attachments and Relations of the Broad Ligaments (Ranney): *P, P*, pelvic bones; *U*, uterus; *V*, vagina; *O*, ovary; *F*, Fallopian tube; *B. L.*, broad ligaments.

sciatic notch and the margin of the obturator foramen, as far down as the level of the ischial spine." According to Polk, as the uterus enlarges during pregnancy the bases of the broad ligaments are carried upward until at term they are almost on a level with the pectineal line; their upper borders are simultaneously moved backward. They return to their former positions after delivery.

The following objects are suspended within the folds of the ligaments: Along the upper margins are the Fallopian tubes, enclosed between the two folds which are attached around their distal extremities, where the serous passes into the mucous membrane. The strip of peritoneum between the tube and the ovary is the mesosalpinx. As the fimbriated extremities do not reach the pelvic walls, the gaps are filled

by the so-called infundibulo-pelvic ligaments, which are simply the distal portions of the upper margins of the broad ligaments. Below the proximal ends of the tubes are the ovarian ligaments, at the outer ends of which are the ovaries. These organs are included between the two layers, but are attached to the anterior and project through the posterior.¹ The term mesovarium is sometimes applied to a portion of the broad ligament just below the attached border of the ovary. A space between the folds of the mesosalpinx, between the distal end of

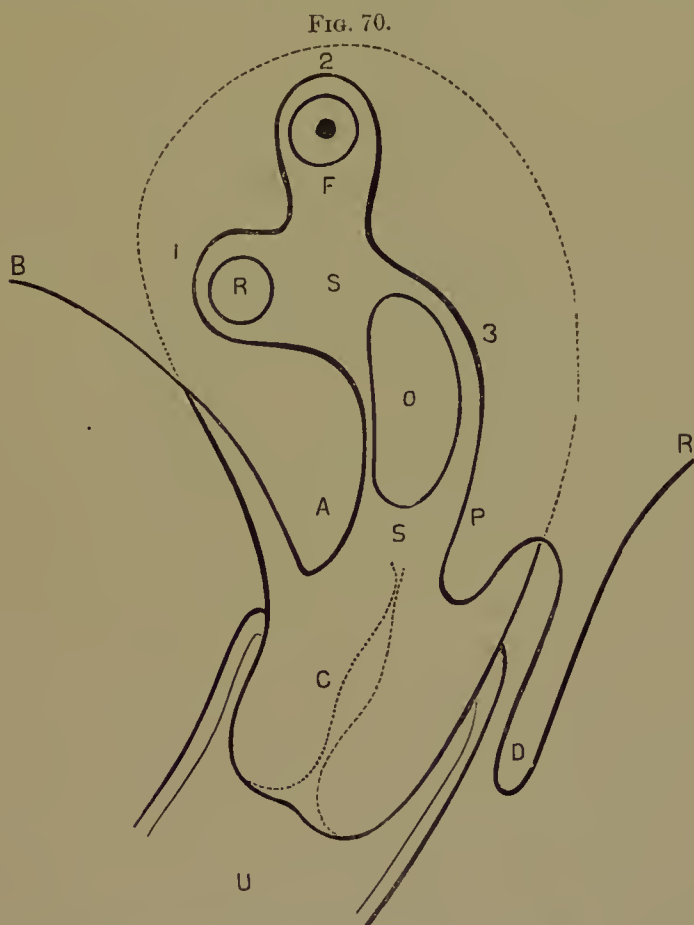


Diagram showing the Three Minor Folds of the Broad Ligament (Ranney): 1, 2, 3, anterior, middle, and posterior folds; R, round ligament; F, Fallopian tube; O, ovary; V, vagina; D, pouch of Douglas; A, anterior layer of broad ligament; P, posterior layer; B, reflection of peritoneum to bladder; R, reflection to rectum; S, space containing muscular and connective tissue, enclosing vessels and nerves.

the ovary and the infundibulum, is called by Olshausen² the bursa ovarica. In the mesosalpinx below the middle portion of the tube is the parovarium. The round ligaments are still lower down, more

¹ Reference has already been made to the assertion of some writers that there is no peritoneum on the posterior surface of the ovary.

² *Krankheiten der Ovarien*, Stuttgart, 1877, p. 7.

internal than the ovaries, and lie in a plane more anterior than the organs already mentioned; the view that the ovary is situated in a separate posterior fold of the broad ligament, the tube in a middle fold, and the round ligament in an anterior, introduces, in the writer's opinion, an unnecessary complication (Fig. 70).

In the space bounded above by the tube and below by the round ligament are the ovarian artery with its branches, the pampiniform plexus, and a dense network of nerves and lymphatics; below this region is one quite free from large vessels. Near the base of the ligament are the uterine artery and venous plexus, and nerves and lymphatics as above. The position of the ureters with reference to the broad ligaments has been made the subject of much discussion, Savage affirming that they are normally found between the laminae, which is denied by Garrigues. As Polk has shown, in nulliparae they extend downward along the lateral walls of the pelvis, passing behind the posterior layers of the ligaments at their points of attachment, and dipping down beneath the bases of the same; during pregnancy the ligaments may change their positions and their folds become expanded, while the ureters are but little disturbed, so that the latter may come to be included within them.¹

After covering the posterior surface of the uterus, the peritoneum dips downward to cover the posterior vaginal fornix and a small portion of the upper extremity of the posterior wall, and then it ascends to the rectum. Two folds, however, cross over directly from the uterus, extending backward and outward in the shape of a letter V, surround the middle part of the rectum, and are attached to the second sacral vertebra.² These are known as the utero-sacral ligaments, or folds of Douglas, and from their structure as well as their function they approach more nearly to the character of true ligaments than do any of the peritoneal processes thus far mentioned. They contain a considerable amount of fibrous and smooth muscular tissue, so that they possess a firm, cord-like feel. They may be described as fibro-muscular bands enveloped by peritoneum.

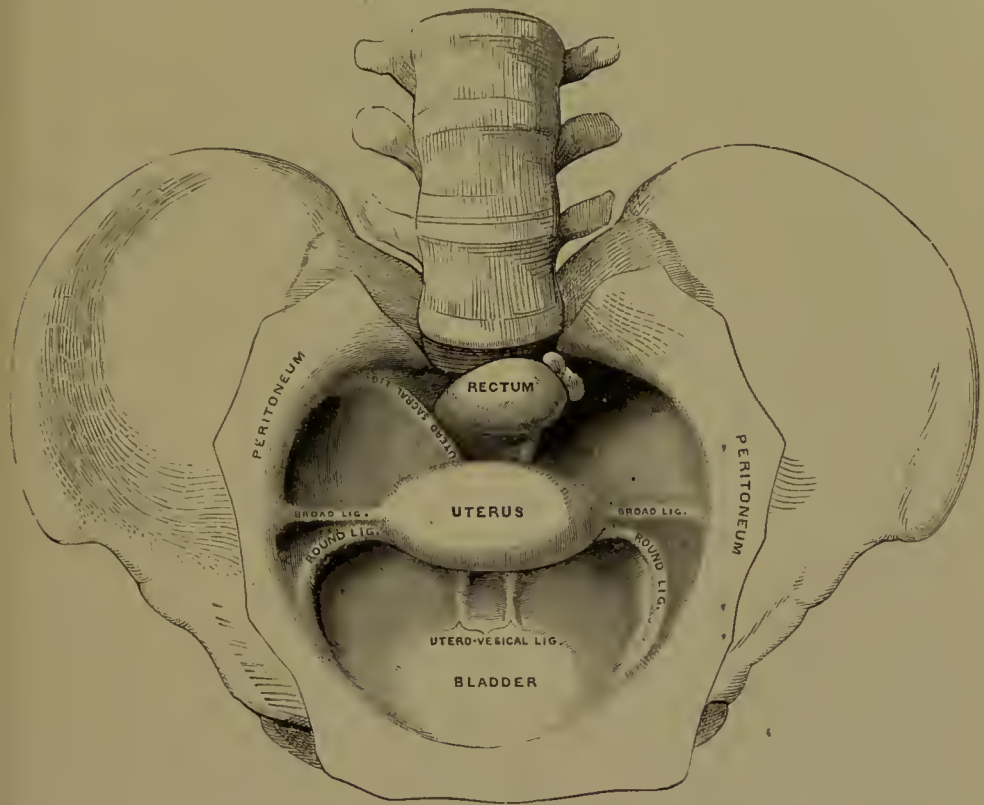
Several well-marked pouches exist in the pelvic peritoneum. The most important of these, as noted in order from before backward, are the pubo-vesical, vesico-abdominal, utero-vesical, and the recto-uterine, or pouch of Douglas. When the empty bladder is in systole the peri-

¹ A consideration of the supporting function of the broad ligaments belongs properly to the article on Displacements. The writer does not believe that they offer much resistance to either antero-posterior displacements or prolapsus of the uterus. When normal, they doubtless oppose to some degree lateral dislocation, just as they may cause lateroflexion when contracted.

² We have Polk's statement to the effect that during gestation the utero-sacral ligaments are elevated *en masse*—not only their uterine origins, but also their points of attachment to the bony pelvis, so that they meet the sacrum near the promontory.

tonemum appears to be reflected directly from the anterior abdominal wall to the uterus, while a depression exists over the site of the bladder which has been called the utero-abdominal pouch. This cavity, when it exists, is filled with coils of small intestine, which are gradually displaced

FIG. 71.



The Reflections and Pouches of the Pelvic Peritoneum (Hodge).

upward as the bladder becomes distended. The vesico-abdominal pouch is only observed during distension of the bladder; its depth varies according to the point at which the serous lining of the abdominal wall is reflected. It is always empty. The vesico-uterine pouch is bounded in front by the posterior surface of the bladder, and behind by the anterior surface of the corpus uteri. The actual depth of this fossa varies less than that of the others, because of the firm attachment of the peritoneum to the uterus. When the bladder is empty the bottom of this pouch is separated by about an inch from the anterior cul-de-sac of the vagina; the entire pouch rises somewhat as the bladder fills. (See Fig. 71).

The pouch of Douglas is the most important, as well as the largest, of the serous culs-de-sac of the pelvis. Its shape and extent are not constant. It is bounded in front by the posterior vaginal wall to the extent of an inch, and by the posterior surface of the supra-

vaginal portion of the cervix, behind by the anterior surface of the middle third of the rectum, and laterally by the utero-sacral folds. In spite of opposing statements, the writer has satisfied himself by repeated observations in both dead and living subjects that Hart and Barbour are correct in asserting that, "*when the bladder is empty and the unimpregnated uterus to the front, there is small intestine in Douglas's pouch, except at its very lowest part.*" The normal depth of the pouch, as well as its precise relation to the posterior cul-de-sac, has been variously estimated. The variations in depth may range between twelve millimeters and three centimeters. The bottom of the pouch (which is the lowest limit of the pelvic peritoneum) may encroach so far upon the space between the rectum and vagina as to reach the apex of the perineal body.¹

Other pouches of less importance might be mentioned. A depression on each side of the bladder is called the paravesical pouch; these pouches may contain loops of small intestine when the bladder is emptied and the uterus lies well forward. The external and internal inguinal pouches, which lie one on each side of the obliterated hypogastric artery, are more properly described in connection with the surgical anatomy of inguinal hernia. The reflection of the peritoneum along the round ligament to form the canal of Nuck has been alluded to in the section on the round ligaments.

Besides the disposition of the pelvic peritoneum in the form of small pouches, we may regard the cavity as divided into two fossæ—an anterior, lying in front of the uterus and broad ligaments, and a posterior, which is situated behind them. From what has already been said, it will be remarked that the peritoneum covering the anterior fossa is not so firmly attached as that in the posterior: this fact is interesting in connection with the theory of the pelvic segments, as will be shown subsequently. The posterior fossa has been further subdivided by Polk into two portions—an upper, which lies above the level of the utero-sacral ligaments, and includes two triangular surfaces called by him the "*retro-ovarian shelves,*"² and a lower, which is Douglas's pouch. The boundaries of each shelf are: in front, the base of the corresponding broad ligament, internally, the utero-sacral ligament of the same side, and externally, the wall of the pelvis. The upper portion of the posterior fossa communicates with the lower through the space which exists between the utero-sacral ligaments. In nulliparæ the most dependent point in the peritoneal lining of the pelvis (excepting, of course, the bottom of Douglas's pouch) nearly always lies above a horizontal plane intersecting the middle of

¹ Pirogoff figures a section of a pelvis in which it descends as low as the ostium vaginae.

² So named because the prolapsed ovaries frequently rest upon them.

the symphysis in front and the point of the union of the third and fourth sacral vertebrae behind. In the pregnant woman, however, the floors of both fossae are raised (the posterior most noticeably), until at the seventh month the retro-ovarian shelves occupy a higher level than the pelvic brim, while at the same time the posterior fossa is contracted by reason of the change in the external attachments of the broad ligaments. Even Douglas's pouch is slightly elevated above its ordinary level (Polk). The changes in the anterior fossa are less striking.

PRACTICAL DEDUCTIONS.—The peritoneum possesses a peculiar interest for the gynecologist, because it not only clothes the pelvic organs, but from its sensitiveness to irritation receives and transmits inflammations from them. Fatal peritonitis has ceased to be regarded as the natural consequence of injury to the serous lining of the pelvis, but localized inflammation is sufficiently common and deplorable in its ultimate consequences. These limited inflammatory foci are most common in two localities, and for different reasons—around the distal extremities of the tubes and ovaries, through the direct extension of inflammation of the lining of the genital tract, and along the bases of the broad ligaments, as the concomitant (or result) of so-called cellulitis. Remembering how the coils of small intestine descend into the pelvis, so that their serous covering is in direct contact with that of the pelvic cavity, it is evident that a peritonitis may remain strictly localized, and yet may result in the formation of adhesions which will impair the functions of several organs. When the laparotomist boasts at the present day that peritonitis is a rare complication, he refers to a general affection of the serous membrane. Some organs are only loosely covered by peritoneum; to others it is closely adherent. This distinction is not unimportant, since injury to the serous coat of the uterus, for example, is a more serious matter than if a tear in the peritoneal covering of the bladder is involved, both as regards hemorrhage and subsequent inflammation.

It is desirable that the reader should rid his mind of the idea that the so-called broad ligaments are "ligaments" in the sense that they furnish much support to the uterus: they rather serve to steady it and oppose lateral deviation of the organ. Doubtless their most important function is to suspend the uterine appendages and to support the network of vessels that ramify between its folds. Cicatrices in either ligament produce lateroflexion, a form of displacement exceedingly resistant to treatment. Tearing of the folds—an accident which is not uncommon in separating adhesions during laparotomy or as a result of too great traction upon the pedicle of an ovarian or tubal tumor—is followed by an obstinate hemorrhage, which it is difficult to control because of the situation of the bleeding points at the bottom of the pelvis. Temporary compression by means of long forceps, or pres-

sure exerted through the vaginal fornix by means of a firm tampon, is sometimes useful when it is impossible to ligate the oozing surfaces.

It is impossible to discuss the subject of sub- and intraperitoneal hæmatocele here; contrary to the opinion advanced by Savage, the peritoneum is capable of being separated from the subjacent tissues to such an extent as to allow of the formation of large extravasations beneath it. This is particularly noticeable during pregnancy; hence the possibility of making gastro-elytrotomy a strictly subperitoneal operation. Recent writers have expressed doubt as to whether pelvic abscess is ever confined to the cellular tissue—*i. e.* they believe that it is, nearly always, of tubal origin. The fact that such abscesses often lie wholly beneath the peritoneum should negative this theory.

The pouches formed by the pelvic peritoneum possess much practical interest. The bottom of the vesico-uterine pouch lies so far above the anterior vaginal fornix that it is not exposed to injury during operations in this region; the distance of the peritoneum from the fornix will be appreciated during the preliminary steps of vaginal extirpation of the uterus, as it is necessary to separate the bladder entirely from the uterus before the serous membrane is reached. It is accordingly advised to open Douglas's pouch and to retrovert the uterus through it before dividing its peritoneal attachments anteriorly. Unless there is an unusually low dip of the vesico-uterine fold, it will not be endangered in any ordinary operation on the cervix, short of high amputation. The bottom of Douglas's pouch, on the contrary, lies normally only one-third of an inch above the tip of the examining finger when introduced into the posterior fornix; this distance may be diminished, not only by the pressure of morbid growths, the fundus of a retroverted uterus, exudations, etc., but by the existence of an abnormally deep dip of the membrane, as in the condition described by Pirogoff, where it covered the posterior vaginal wall almost as low as the vulvo-vaginal outlet. Less significance is attached to the opening of the peritoneal cavity through the posterior fornix now that the principles of drainage are better understood. Note that the middle portion of the rectum is only partially covered by peritoneum (anteriorly), although sufficiently to be affected by inflammations and adhesions of that membrane.

The utero-sacral ligaments are, as before stated, essentially folds of peritoneum strengthened by fibro-muscular tissue; whether peritonitis or cellulitis is the inflammation most common in them is an open question. Probably both the serous and fibrous tissues are involved in nearly every case of so-called "parametritis posterior." They are commonly contracted in epithelioma of the cervix, even where the broad ligaments are not involved, and complicate the final steps of

vaginal hysterectomy. The supporting function of these bands will be discussed later.

As regards the much-vexed question of the relative frequency of peri- and parametritis, it may be added that the anatomical evidences are greatly in favor of the former, as will appear to the reader who considers the various sources of infection to which the peritoneum is exposed. The results of recent studies in tubal pathology have led to a change of views on the subject of pelvic inflammation.¹

PELVIC CONNECTIVE TISSUE.

There are few subjects in the whole range of normal and pathological anatomy about which so much has been written—and blindly written—as that of the cellular tissue of the female pelvis. It is the *bête noire* of the student and the stumbling-block of the more mature. Instead of taking a rational view of the matter and remembering that connective tissue possesses exactly the same structure, appearance, and functions in whatever region of the body it may be found, nine men out of ten approach the study of the pelvic areolar tissue in somewhat the same spirit as they begin that of the brain—with the idea that they are about to grapple with a thing *sui generis*, the thorough mastery of which will be a formidable task. Doubtless writers on gynecology are responsible partly for this notion, since they have been somewhat disposed to adapt anatomical facts to pathological theories, instead of taking that broader view of the subject which can alone prevent one from falling into error, whether of theory or of practice.

The pelvis is not an independent region of the body, neither do its various tissues exist under different conditions from the same tissues in other portions of the body. In considering the pelvic areolar tissue as a whole instead of referring to it under the description of each organ, we not only gain a clear idea of its relations to the separate organs, but are able to appreciate better its close continuity with the entire fibrous framework of the body.² Although this continuity may not always be as clearly marked as in the case of the membrane which has just been studied, it is none the less present, as will be seen.

Connective tissue, whether it appears in the form of areolar or lymphoid tissue, cartilage, or bone, always has the same office—"to connect and support the other tissues, performing thus a passive mechanical

¹ Comp. paper by the writer on "The Exaggerated Importance of Minor Pelvic Inflammations" (*N. Y. Med. Journ.*, May 15, 1886); also paper by Prof. W. M. Polk in the *N. Y. Med. Record*, Sept., 1886.

² Freund (*Gynäkologische Klinik*, Strasburg, 1885) has complicated the subject by describing the connective tissue around the various organs by separate names. He refers to the "paracystium," "paraecolpium," "paraproctium," etc.

function.”¹ As viewed in the pelvis, it appears under two varieties or systems:² 1. As a loose tissue which is distributed apparently in a most irregular manner around and between organs, and between the layers of the broad ligaments, where it serves to support the blood-vessels, the folds of peritoneum, etc.; 2. As firm, well-defined laminae or planes which enter into the formation of the pelvic floor, and together constitute the “pelvic fascia.” The latter will be described with the pelvic floor.

Considered in its entirety, all of this connective tissue forms the middle layer of the three, which begins above with the peritoneum; it may be traced from before backward in a vertical median section, just as was done with the peritoneal layer, beneath which it lies throughout. Passing down the anterior abdominal wall below (that is, anterior to) the peritoneum, as low as the posterior aspect of the pubic symphysis, it stretches across to the anterior surface of the bladder, as the pubovesical, or anterior true ligaments of that organ. Immediately behind the pubes it contains a quantity of adipose tissue (retro-pubic fat), which has a triangular outline in mesial sections of the pelvis, the bladder being empty. The position of this pad of fat varies in different attitudes of the body: when the patient is in the genu-pectoral posture it sinks downward and forward, so as to be below (*i. e.* above) the symphysis. There is a certain amount of areolar tissue in the space bounded by the lower part of the posterior vesical wall in front and the cervix uteri and upper third of the anterior vaginal wall behind. This tissue contains a venous plexus, and serves to unite the vagina to the base of the bladder.³ When the latter is empty this “vaginovesical process” is all that intervenes between the peritoneum and the anterior cul-de-sac.

The lower two-thirds of the anterior vaginal wall are so firmly attached to the urethra by an intermediate layer of connective tissue that it is possible to separate them only by careful dissection. While the supravaginal portion of the cervix is surrounded by a quantity of loose fibrous tissue, on the fundus and anterior surface of the uterus, as well as beneath the vesico-uterine fold, there exists only the delicate subperitoneal layer before described (the “platysma” of Savage). Laterally, however, the tissue is again well marked, where it extends outward between the folds of the broad ligaments. This same platysma, composed as it is of fibrous, elastic, and smooth muscular tis-

¹ Schäfer, *Essentials of Histology*, p. 30.

² The loose cellular tissue of the pelvis has been divided by some authorities into two “processes”—a “pubo-sacral,” including the median portion of the layer, extending from the symphysis pubis to the sacrum, and a “utero-iliac,” which comprises the fibres extending outward from the lateral borders of the uterus to the pelvic wall between the folds of the broad ligaments.

³ It is the “parametric” tissue of Virchow.

sue, is reflected on to the tubes, round ligaments, utero-sacral, and ovarian ligaments, forming their superficial layer.

It is difficult to understand how some authorities can deny the presence of fibro-muscular tissue in the broad ligaments. Reasoning from analogy, the presence of such a rich vascular area as that which lies between these folds of peritoneum presupposes the existence of no inconsiderable quantity of such tissue in the immediate neighborhood

FIG. 72.



Mesial Section of the Pelvis, cutting at junction of Broad Ligament and Uterus: *a*, vagina, with its walls separated; *b*, bladder; *c*, symphysis; *d*, broad ligament; *e*, ovary; *f*, Fallopian tube. (Hart and Barbour).

of the blood-vessels.¹ This alone would be a convincing proof, even if it were not possible to trace with ease distinct bands of fibres which are continuous with the general connective tissue of the pelvis. Guérin's² idea, that the tissue between the folds of the ligaments has no connection with the rest, is not tenable, any more than if it was affirmed that the included vessels were independent of the general

¹ The reader will also remember that each fold of peritoneum has its own platysma layer.

² Guérin, "Sur la Structure des Ligaments larges," *Comptes rendus*, 1879, p. 1364.

pelvic circulation. In point of fact, the application of the term "ligaments" to these reduplications of the peritoneum is only justified by the presence in them of a strong fibrous and muscular framework, as was shown in the case of the sacro-uterine bands. Without such a framework they could not even furnish proper support to the vessels and nerves, not to speak of the uterine appendages. In short, the connective tissue of each broad ligament is *the ligament itself*; the peritoneal folds constitute simply a thin veil which is thrown over the former, but which does not increase its strength.¹ The tissue in question enters the broad ligament from various sources. The superficial muscular stratum of the uterus contributes numerous delicate fibro-elastic bands; others are reflected from the external layers of the tubes and round ligaments. The vessels carry with them their own supporting tissue and the peritoneal folds have their thin elastic substratum. The areolar tissue seems to be most abundant at the bases of the ligaments, where it blends with the mass already referred to, which surrounds the cervix uteri and roof of the vagina, filling the interval between these and the neck of the bladder. The richness of the blood- and lymph-supply of these parts was noted in another place. The practical importance of these facts will be evident in connection with the pathology of cellulitis.

Proceeding backward from the broad ligaments, we observe a thin subperitoneal layer on the posterior surface of the uterus; it is not so intimately united to the subjacent muscle as it is over the fundus and anterior aspect of the organ, so that a certain amount of separation of the peritoneum is possible. Between the rectum and the posterior vaginal wall there is a stratum of areolar tissue which extends downward as low as the apex of the perineal body, establishing a loose connection between the two canals (recto-vaginal process). The upper portion of this tissue surrounds the supravaginal portion of the cervix and the posterior fornix. As in the vesico-uterine pouch, it separates the fornix from the peritoneal cavity. The entire thickness of the tissues intervening between the latter cavity and the vagina is estimated at not over a third of an inch. The opinion has already been expressed that the "folds of Douglas," or utero-sacral ligaments, are true ligaments, consisting of bands of fibrous tissue enclosing elastic and muscular fibres, the latter being derived from both the uterine and the vaginal walls. Their direction is such (upward and backward) that they would lie almost in a line with the

¹ The unstriped muscular tissue of the broad ligaments is thickest near the borders of the uterus. As we trace them outward both the fibrous and muscular bundles decrease in number and size, until, on reaching the pelvic wall, they have almost entirely disappeared. Note that the bases of the broad ligaments are in contact with the lateral culs-de-sac of the vagina, except when the former are elevated during pregnancy (Ranney).

anterior wall of the vagina if it were extended backward (Fig. 73).¹ Luschka² well described both the structure and the functions of these folds when he applied to them the name *musculus retractor uteri*. The "pubo-sacral" process of connective tissue terminates in a thin layer which separates the rectum from the sacrum.

A description of König's method of demonstrating the continuity of the subperitoneal connective tissue by means of injections of air or fluids belongs more properly to the subject of experimental pathology. His results, as summarized by Bandl, were briefly as follows: On injecting water into the space between the folds of one broad ligament, the site of the injection being near the upper edge of the ligament, it first extended outward to the pelvic wall, then entered the iliac fossa beneath the peritoneum; from this point it made its way both upward along the anterior abdominal wall, and downward along the wall of the true pelvis. If injected below the base of the ligament, however, anterior to, and a little to one side of, the utero-cervical junction, it first spread in a lateral direction, and later distended the vesico-uterine subperitoneal space; it then made its way beneath the peritoneum covering the anterior surface of the supravaginal cervical segment and the posterior aspect of the bladder, and ran along the round ligament to the internal ring, turned to the left to follow the line of Poupart's ligament, and terminated in the iliac fossa. If fluid is introduced posterior to the base of the ligament, it first infiltrates the corresponding half of the posterior fossa, then extends to the iliac fossa, and eventually reaches the anterior abdominal wall as before.³

PRACTICAL DEDUCTIONS.—Great importance has been attached to the manner of distribution of the pelvic cellular tissue in connection with the study of parametritis and abscess-formation. For details the reader must consult special works. In some localities it is evident that an inflammatory process may be limited to this tissue; in others (notably in the broad ligaments) it is difficult to conceive how the peritoneum can fail to be involved. The experiments of König and Bandl, in which fluid or air was injected into the cellular tissue of the pelvis in order to determine the course taken by collections of pus, explain the "pointing" of abscesses in the perineum, in the inguinal region, or even as high up as the umbilicus. König holds, briefly, that an exudation between the folds of the broad ligament eventually makes its way to the floor of the pelvis along the ilio-psoas muscle, while

¹ For an ingenious explanation of the action of these ligaments, consult Foster's paper on "The Mechanical Action of Pessaries," *Am. Gyn. Trans.*, 1881. Comp. Foster's diagram, reproduced by Ranney (*op. cit.*, fig. 6).

² *Op. cit.*, p. 361.

³ Elaborate experiments of the above character have been reported by Schlesinger (*Med. Jahrb. der K. K. Gesellschaft d. Aerzte in Wien*, Heft 1-2, 1878). See also Bandl, *op. cit.*, pp. 109-114.

a collection of pus forming near the side of the cervix follows the course of the cellular tissue at the lateral borders of the uterus, then passes beneath the inguinal canal along the round ligament, and, reaching Poupart's ligament, turns backward and outward to reach the iliac fossa. Rupture of a pelvic abscess into the peritoneal cavity is fortunately rare, spontaneous perforation into the vagina, rectum, or bladder being much more common. The danger of hemorrhage in incising an abscess through the fornix is not imaginary, and should render the thermo- or galvano-cautery preferable to the knife.

Subacute inflammation of the cellular tissue is a common result of puerperal lesions, especially laceration of the cervix. However we may differ in regard to the character and significance of the indurations which are found at the bases of the broad ligaments in cases of deep laceration of the cervix, we must admit that they do exist, and that they radiate directly outward from the angle of the tear. Dr. Emmet has attached great importance to their detection by palpation through the vaginal fornix, and to the advisability of endeavoring to promote their absorption by means of hot-water injections and local applications before the operator can safely or successfully repair the lacerated cervix. He is also inclined to regard utero-sacral cellulitis as a consequence of injury to the cervix—a sequence which, from the indirect relation of the parts involved, is by no means clear.

While the writer has no desire to dwell upon his personal views regarding the treatment of chronic cellulitis, he cannot avoid the temptation to propose to the reader the consideration of the following questions in the light of the foregoing anatomical studies: Are small cicatrices or strictly localized thickenings in the serous or cellular tissue of the pelvis capable of obstructing the circulation over a sufficient area to cause chronic engorgement of the uterus and its appendages? Does the constricting action of hot vaginal injections directly affect the vessels not contiguous to the fornix? Does the entire pelvic circulation feel their influence, or is anæmia produced in one locality at the expense of hyperæmia in another? Let the reader recall what has been said regarding the extent and continuity of the venous plexuses, and answer for himself.¹

One more question may be permitted: Is it in the power of hot-water injections, iodine, and glycerin-tampons to act through the vaginal fornix in such a manner as to cause the absorption and disappearance of firm, non-vascular cicatricial bands, which may be situated within the pelvis from a third to half an inch from the spot

¹ It is claimed that in these questions we are dealing with known clinical facts. No one denies the local hæmostatic and astringent action of hot water; reference is made to its power to modify the circulation at distant points.

reached by the injection or application? Whatever direction our anatomical speculations may take, clinically we shall never regret the adoption of the routine practice of regarding with suspicion all evidences, whether subjective or objective, of former periuterine inflammation, and of restraining our *ardor operandi* accordingly.

Since the utero-sacral folds of peritoneum are, by reason of their contained connective tissue and mode of attachment, true ligaments, it seems advisable to study their normal and pathological action here. This V-shaped process, which can usually be distinctly felt through the posterior fornix, is attached to the uterus just above the isthmus, in such a line that it forms with the anterior vaginal wall what Foster has aptly called a "supporting beam"—the two structures opposing each other and retaining the uterus (which lies in the middle of the beam) in its normal position. That the ligaments contain a sufficient amount of muscular fibre to justify Luschka in calling them the "*retractores uteri*" is proved clinically, not only by the state of tension which is observed in them during a vaginal examination, but also by the fact that they often distinctly relax under the influence of an anæsthetic. The writer has affirmed, as the result of clinical and anatomical observations, that the diagnosis of "thickening of the utero-sacral ligaments" (parametritis posterior) is often based upon a supposed prominence or tension of these cords which is entirely normal. Every gynecologist must have noticed how moderate antelexion, due to apparent shortening of the ligaments, has been practically eliminated after the patient was anæsthetized.

True cicatricial contraction of the utero-sacral folds (whether as the result of cellulitis or peritonitis, or of a combination of the two conditions) leads to antelexion and vesical irritation, the latter symptom being one of the most trying with which the gynecologist has to deal. The futility of expecting to accomplish much by the use of antelexion

FIG. 73.

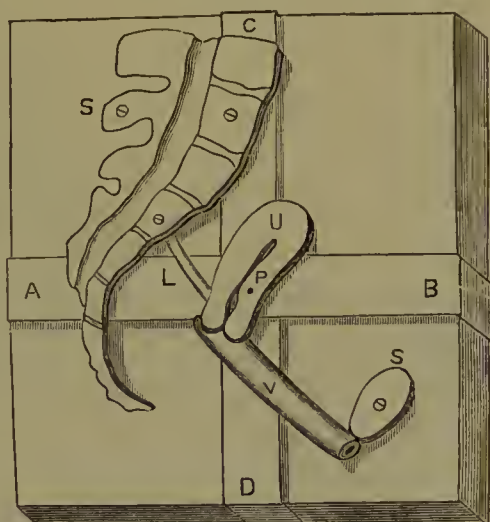


Diagram of Model designed to show the supporting action of the Anterior Vaginal Wall and the Utero-sacral Ligaments (Foster): A, B, C, D, two elastic bands intersecting at the point of attachment of the uterus (U), which is fastened to them by a pivot (P); S, synfysis pubis fastened firmly to block, as is also the sacrum (S); U, uterus rendered movable in all directions by the elastic bands; V, vagina, represented by a piece of rubber tubing; L, rubber band representing utero-sacral ligaments.

pessaries will be apparent to any one who views the displacement even from a purely mechanical standpoint, since the problem is not to elevate the fundus, but to relieve backward traction on the organ. Neither does dilatation of the cervical canal for the purpose of overcoming the mechanical obstruction (with or without the introduction of a stem pessary) fulfil the main indication, which is to *stretch the shortened ligaments*. How far it is possible to accomplish this clinically by means of tampons, massage, etc. we shall not attempt to decide here.

PELVIC FLOOR.

SYNONYMS.—Pelvic diaphragm; *Lat.*, diaphragma pelvis; *Fr.*, plancher pelvien; *Ger.*, Beckenboden.

DEFINITION.—By the pelvic floor we understand the *ensemble* of the soft parts which close the outlet of the pelvis. Strictly speaking, this definition includes several of the organs already described (the rectum, vagina, and bladder), as well as the serous and fibrous layers which have just been mentioned. We shall limit it to the actual diaphragma pelvis²—*i. e.* the levatores ani muscles, with the layers of fascia above and below them, the perineal body, with the muscles and fasciæ entering into its composition, the ischio-rectal fossæ, and the integument covering the whole.

In order to possess a clear idea of the diaphragm we may imagine that we are looking down upon it from above, after having removed the uterine and broad ligaments, together with the peritoneum, and cleared away as much of the loose connective tissue as suffices to expose the underlying fascia. We have now to consider from above downward—that is, from within outward—the following distinct laminae: Two layers of fascia, a superior (recto-vesical) and an inferior (anal), between which are the levatores ani; below these is a space occupied posteriorly by the lower end of the rectum, with its muscles, and a quantity of fat (ischio-rectal fossa), and corresponding anteriorly to the cavity between the two layers of the triangular ligament. Still lower are the inferior boundaries of these spaces—behind, the obturator fascia; in front, the anterior layer of the triangular ligament. Next comes the deep layer of the superficial perineal fascia; and lastly, the superficial layer and the integument.

We may group the component parts of the pelvic floor into a superior and an inferior layer, the latter including the parts ordinarily exposed in a dissection of the perineum, which may be studied best from below. The superior or deeper parts will first be considered.

¹ For exhaustive details refer to Hart's monograph, "The Structural Anatomy of the Female Pelvic Floor," Edinburgh, 1881.

² Under this term German writers refer, as a rule, to the levatores ani alone.

Although the arrangement of the pelvic fascia is explained in all of the standard works on general anatomy, the descriptions nearly always have reference to the male pelvis, in which the relations of the parts are comparatively simple. In the female the floor is pierced by the vagina, so that a complication is thus introduced which renders a separate description of the parts necessary. The pelvic fascia, as viewed

FIG. 74.

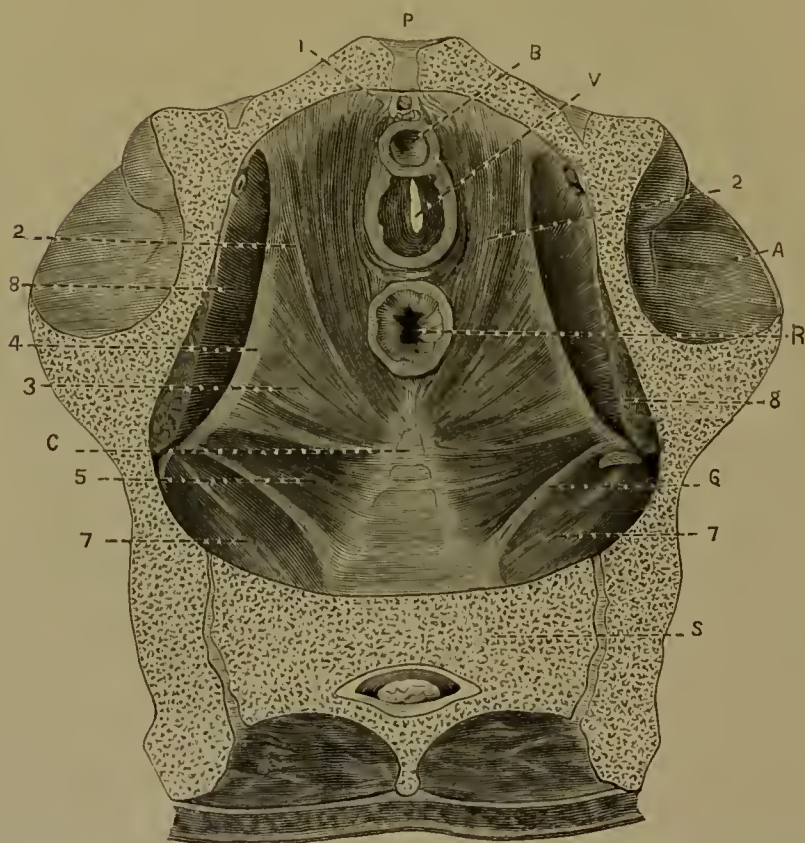


Fascia of Pelvic Floor (Savage): *B*, bladder; *V*, vagina; *R*, rectum; *P*, pubic symphysis; *S*, sacrum; *a*, fascia covering psoas muscle; *b*, obturator fascia; *c*, ilio-pubic line; *d*, reflection of fascia on to the rectum, vagina, and bladder; *e*, posterior portion of pelvic fascia covering sacral vessels and nerves; *f*, iliac fascia, covering iliac vessels; *g*, gluteal vessels; *h*, ischiatic vessels; *i*, internal pudic vessels; *k*, obturator vessels.

from above, is seen to be attached laterally to the pelvic brim; anteriorly, its line of attachment extends downward, following the origin of the obturator muscles, and terminates near the lower border of the symphysis pubis. As it crosses the obturator foramen the fascia becomes attached to the membrane which covers that opening. Posteriorly, it is adherent to the spine of the ischium, behind which point it is continuous with a thin lamina that covers the pyriformis muscle and sacral plexus (fascia of the pyriformis); the latter separates the sacral plexus

from the iliac vessels, branches of the latter piercing the pelvic fascia.¹ The attachment of the pelvic fascia is clearly indicated by a tendinous band ("white line") which extends from the spine of the ischium to the lower portion of the symphysis. From this line springs the recto-vesical fascia, which is now regarded as the direct continuation of the pelvic, instead of the obturator, fascia, as is still affirmed by many anatomists.² The recto-vesical process arises as above mentioned, extends downward and inward, lying upon the upper surface of the cor-

FIG. 75.



Muscles of Pelvic Floor (Savage): B, neck of bladder; 1, vagina; R, rectum; P, symphysis pubis; C, coccyx; S, sacrum; A, acetabulum; 1, anterior vesical ligaments; 2, pubo-coccygeal portion of levator ani; 3, obturator-coccygeal portion; 4, ilio-pubic line of the latter; 5, ischio-coccygeal portion; 7, pyriformis muscle; 8, obturator muscle.

responding levator ani, and unites in the median line with the fascia of the opposite side. The fascial diaphragm thus formed, which separates the pelvic from the perineal space, is perforated by two slits, the vagina and the rectum. It is firmly attached to the walls of these canals, and

¹ Comp. Quain's *Anatomy*, vol. i. p. 326; Ellis, *Dissections*, p. 546; Carrington, *Dissections*, pp. 145 and 160-167; Heath, *Practical Anatomy*, pp. 266-268.

² Carrington, *op. cit.*, p. 161; also Quain, *op. cit.*, p. 326.

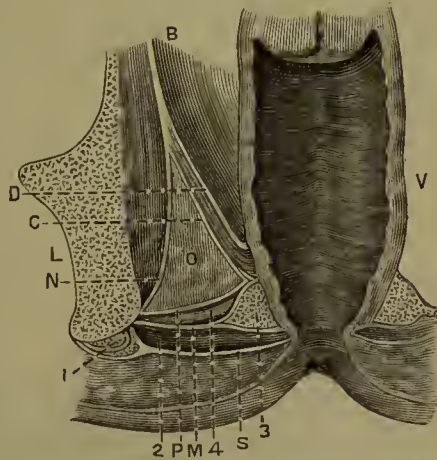
sends off from its under surface fibrous sheaths which surround and follow the tubes downward.

The rectal sheath covers the lower three inches of the bowel, gradually disappearing toward the anus; it lies immediately over the superior hemorrhoidal vessels. The vagina also has an envelope, which may be traced along the tube to its lower end, where it becomes lost in the deep perineal fascia (?). It covers the vaginal plexuses and constitutes the external layer of the vaginal wall.

The bladder also receives support from the same source, the anterior true ligaments being formed by two processes which extend from the back of the pubes (the anterior attachment of the fascia) to the neck of the bladder; between these special processes the recto-vesical fascia is said by Ellis to descend to the triangular ligament of the urethra, of which it forms the posterior layer.¹ The lateral ligaments of the bladder are formed by fascial bands which are attached to the postero-lateral border of the vesical base. The rectum has also two lateral ligaments derived from the same fascia, which are attached externally to the ischial spines, and oppose lateral displacement of the gut.

On removing that portion of the recto-vesical fascia of both sides which covers the floor of the pelvis, by detaching it along the entire length of the white line externally and from its attachments to the pelvic organs internally, the subjacent muscular stratum will come into view (Fig. 75). This consists of two pairs of muscles, the coccygei and the levatores ani, the former being comparatively unimportant in this connection. The coccygei (levatores coccygis, ischio-coccygei of Savage) are two thin, triangular muscles which spring from the upper portions of the ischial spines, and by a few slips from the lesser sacro-sciatic ligaments, and pass inward, gradually expanding into broad, thin laminae that are attached to the lateral borders of the lower segment of the sacrum and to the anterior surface and

FIG. 76.



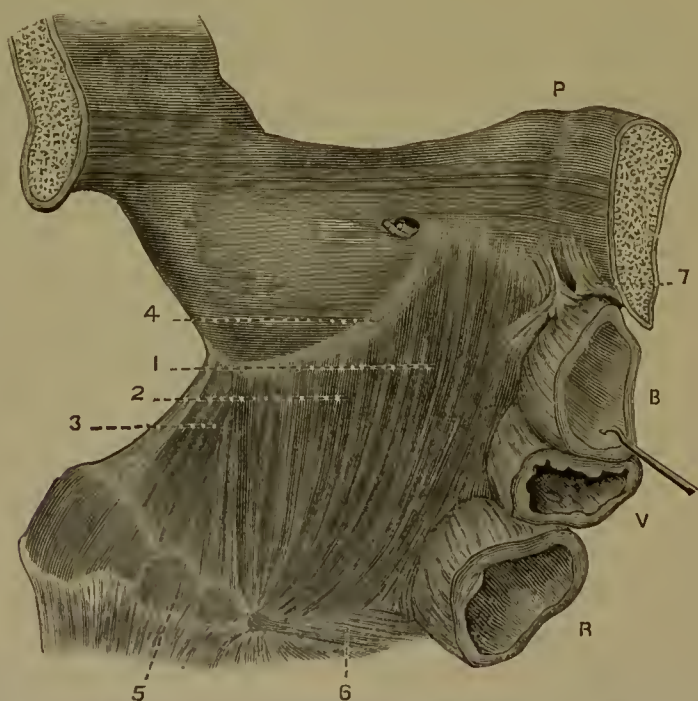
Perpendicular transverse Section of Pelvis through middle of Vagina (Savage): V, vagina, showing posterior wall; O, ischio-rectal fossa, filled with fat; I, ischial tuberosity; B, inferior pelvic space; D, recto-vesical fascia, covering upper surface of levator ani; C, fascia covering lower surface of levator ani; N, obturator fascia; P, posterior aponeurosis of perineal septum; M, anterior aponeurosis of same; S, deep layer of superficial perineal fascia; 1, cross-section of right crus clitoridis, including erector muscle; 2, superficial transverse perineal muscle; 3, bulb of vagina; 4, muscle of perineal septum.

¹ Denied by Carrington (*Manual of Dissections*, p. 165), who insists that the deep layer is formed by the obturator fascia.

borders of the coccyx. Their inner (pelvic) surfaces are covered by special layers of fascia continuous with the recto-vesical. The upper surface of the left coccygeus is in contact with the rectum, which it partially supports. The lower surfaces rest upon the glutei maximi and the lesser sacro-sciatic ligaments; in front are the posterior borders of the levatores; behind, the pyriformis muscles, separated from the pair under consideration by vessels and nerves.

The levatores ani have such extensive origins and insertions that each muscle is divided by Savage into two separate portions, pubo- and obturato-coccygeal. The coccygeus muscle he includes with the levator under the name of the ischio-coccygeus. Each levator arises in front from the posterior aspect of the pubes near the symphysis (pubo-coccygeus), behind, from the lower and inner surface of the

FIG. 77.



Attachment of the Muscular Floor of the Pelvis to the Bladder, Vagina, and Rectum (Savage):
B, bladder; *V*, vagina; *R*, rectum; 1, pubo-coccygeus; 2, obturato-coccygeus; 3, ischio-coccygeus; 4, ilio-pubic attachment of muscle; 5, coccygeal attachment; 6, median raphe; 7, *Arcus tendineus* of Luschka, aponeurotic fibres reflected to bladder.

ischial spine, and between these origins from the "white line" that represents the point of division of the pelvic fascia. It is also connected by fleshy slips with the obturator fascia and the posterior layer of the triangular ligament. The anterior fibres may form a separate bundle, an interval existing between them and the rest of the muscle; these extend downward and inward contiguous to the posterior layer

of the triangular ligament, and unite in the median line of the pelvis with the corresponding portion of the opposite muscle. The urethral and vaginal slips perforate the muscular diaphragm here, and receive slips from it; behind the vagina the internal fibres of opposite muscles meet and blend with the deep transverse perineal muscles in the perineal body. The prolongations of the pubo-coccygeus on the sides of the vagina and urethra correspond to Santorini's muscles (*levatores prostatae*) in the male.¹ The posterior portion (Fig. 77) of the pubo-coccygeus (corresponding with the middle portion of other anatomists) unites with its fellow to surround the lower end of the rectum, which it suspends as if in a sling, and blends with the external (and, to some extent also, with the internal) sphincter. The most posterior of the fibres unite behind the rectum in a median raphé which terminates at the end of the coccyx. The posterior part of the levator (the obturator coccygeus of Savage) meets its fellow in the raphé behind the rectum, and both are inserted into the sides of the last two coccygeal vertebræ, below the insertions of the coccygei (*ischio-coccygei*).

From the above it will be evident that the *levatores ani* form a thick septum across the pelvic outlet, the general shape of which is concave; this septum at its periphery has bony attachments extending around the brim of the pelvis, while its centre has no fixed support. In the median line it is weakened by the presence of the vaginal slit, which defect is obviated to some extent by the fact that the vaginal walls are normally in close apposition, and that the canal cuts the pelvic floor at an angle of about sixty degrees (Hart and Barbour). The firm attachment of the muscular diaphragm to the genito-urinary organs is an important factor in connection with the maintenance of their proper positions.

A thin layer of fascia covers the under surface of the levator; it arises from the pelvic brim below the origin of the muscle, and is attached to the obturator fascia, while in the median line it blends with the opposite lamina and is attached to the rectum and vagina in the same manner as the recto-vesical fascia, although it is much less developed than the latter. Anteriorly, it is attached to the posterior layer of the triangular ligament. It is in immediate relation below with the fat which fills the ischio-rectal fossa. A description of the obturator fascia does not really belong here, since it merely covers the inner surface of the obturator muscle, and thus forms the outer wall of the ischio-rectal space.

After removing the layers above mentioned there remain only the superficial structures which close the pelvic outlet. The ischio-

¹ Note that Savage's description of the insertion of the pubo-coccygeus is peculiar, in that he represents the fibres as running downward and backward, rather than downward and inward.

rectal fossæ do not need a special description, since their anatomy is the same as in the male. The perineal body, on the contrary, is a structure peculiar to the female.

THE PERINEAL BODY.¹

SYNONYMS.—(*Gr.*, περιναϊον; *Lat.*, perinæum; *Fr.*, périnée; *Ger.*, Damm; *It.* and *Sp.*, perineo.

Between the lower ends of the rectum and vagina is a somewhat pyramidal space, formed by the divergence of the two canals that have been described as lying in close contact as low as an inch and a half above the anus. This space is filled by a mass of fibro-muscular tissue, which is attached not only to the anterior wall of the rectum and the posterior wall of the vagina, but also to the pelvic floor. Its dimensions are variable, depending not only upon the muscular development of the individual, but upon the amount of adipose. It is common to represent it in mesial sections as a perfect triangle. It is highly desirable that these diagrammatical figures should cease to be reproduced in modern textbooks, to mislead the inexperienced reader and to give him false ideas of the aims of gynecological surgery. Now that the "keystone" theory of the perineum has been rejected by all thoughtful men, the inaccurate representations of the supposed keystone should not be retained as the *exuvie* of a discarded error. The perineal body is neither a triangle nor a pyramid, but, as we learn from a careful study of the region both in the living female and in frozen sections, it is irregularly quadrilateral in form;² sometimes it has almost the shape of a gourd, the neck of which corresponds to the "apex" of the triangle, as formerly described.³

The quadrilateral shape of the perineum is, as Foster has shown by careful measurement, largely the result of muscular action, which draws the body forward, causing a prominence near the ostium vaginæ that forms the anterior angle of the square. Two sides of the square rest thus against the vaginal wall, a third looks toward the rectum, and the fourth represents the space between the posterior vulvar commissure and the edge of the anus. If, as the same writer states, through weakness of the muscles attached to the perineal body, it is not drawn forward in the usual manner, it may present but a single surface anteriorly, and then it has the triangular shape usually figured. As before stated, its dimensions are variable. Its upper limit—or rather the point at which the rectum and vagina begin to diverge—is about an

¹ For literature refer to Hart and Barbour, and to Ranney's paper on "The Female Perineum" (*N. Y. Med. Journ.*, July and Aug., 1882).

² Foster, "Topograp. Anat. of Uterus, etc.," *Am. Journ. Obstet.*, vol. xiii., 1880.

³ "The eucurbit of an alembic" (Garrigues, *Am. Journ. Obst.*, April, 1880).

inch and a half from the anus. The presence of a thick layer of adipose in a fat subject will of course increase the distance between its apex and the surface of the integument. The transverse measurement is an inch and a half, the antero-posterior from three-quarters of an inch to an inch. Its relations have already been mentioned. Anterior to it lie the vagina, behind, the rectum and anus, laterally, fat; below, the integument of the perineal space, above, the lower end of the fibrous septum uniting the vaginal and rectal walls. The entire body lies below a horizontal plane passing through the subpubic ligament in front and the tip of the coccyx behind.

Hitherto we have followed the dissection of the pelvic floor from above. The perineal body is best understood by adopting the usual order described in manuals of dissection. Unfortunately, there is much confusion as to the exact meaning of the term "perineum," nearly all of the works on anatomy defining it as the entire lozenge-shaped space which corresponds to the pelvic outlet. Others divide this space into an anterior and a posterior perineum, the latter including the anus and the ischio-rectal fossæ, the former, the parts included between the symphysis and pubic rami as far backward as an imaginary transverse line joining the tuberosities of the ischium. "The *true* perineum of the female," adds a writer, after making the above division, "is between the posterior commissure of the labia and the anal orifice."¹ The only satisfactory way out of the difficulty is, as Hart and Barbour suggest, to keep always before the mind the idea of a perineal *body*, of which the "perineum" of the anatomists is merely the "skin over the base."²

In reviewing briefly the anatomy of this region reference will be made to certain structures closely related to it which have already been mentioned in connection with the external genitals. Having removed the integument, not only over the perineum proper, but over the entire urethral triangle, the superficial fascia will be exposed. This may be separated into two layers—a subcutaneous, which consists of fine trabeculæ of fibrous tissue enclosing masses of fat and branches of the superficial perineal and hemorrhoidal vessels and nerves, and a deep layer, which is of considerable importance. The latter is attached along the anterior edges of the pubic and ischiatic rami³ almost as far back as the tuberosities. It is limited posteriorly by the transversus perinei muscles, around which it turns to become continuous with the subpubic fascia (anterior layer of the triangular ligament, perineal septum of Savage). The lower edge of the perineal septum, which is strengthened by the attachment of the deep layer of fascia, is called the ischio-peri-

¹ Heath, *Practical Anatomy*, p. 173.

² Hart and Barbour, *op. cit.*, p. 38.

³ Savage describes an "abdominal portion," which is attached to Poupart's ligament (*op. cit.*, p. 13).

neal ligament by Savage, who describes it as "an extremely resisting aponeurotic band attached by its outer ends to the rami of the ischium, somewhat in front of their tuberosities. They are confounded," he adds, "in the structure of the perineal body." The perineal septum, as described and figured by Savage, is best understood by a reference to the figures. This fascia can be traced directly into the labia majora, and through them to the external inguinal rings, to the edges of which it is attached, forming on each side the "pudendal sac" (*sac dartoïque*) before described, in which the terminal fibrils of the round ligaments are found.

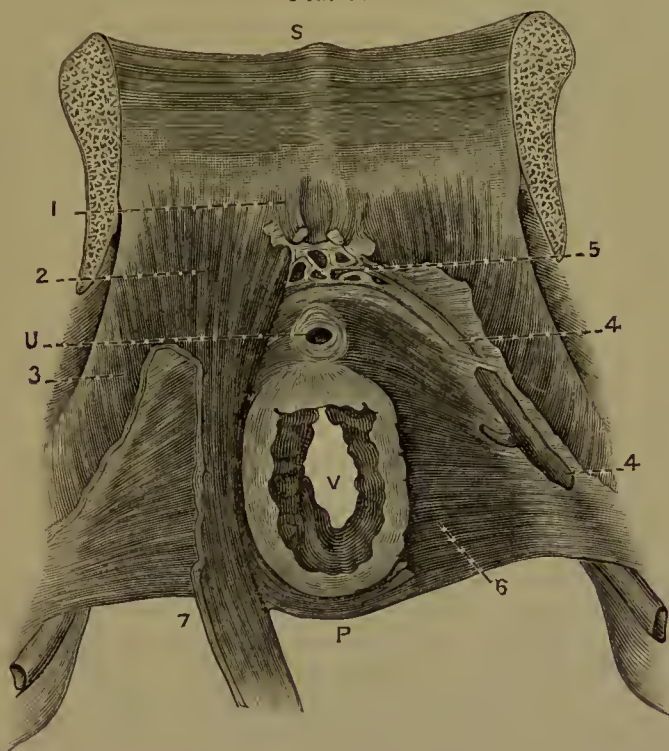
On clearing away the tissue above mentioned, which, with the integument and superficial fascia, is intimately related to the base of the perineal body, the so-called perineal muscles will be exposed, as well as the "perineal septum," or anterior layer of the triangular ligament, in recent nomenclature. The latter is comparatively a weak structure in the female, because of the manner in which it is encroached upon by the urethra and vagina. The muscles which are immediately connected with the perineal centre, as it is sometimes called, are the bulbo-cavernosi, transversus perinei, sphincter, and levatores ani (pubo-coccygeal portions). The transverse perineal vessels and venous plexuses will be exposed with the muscles.

The bulbo-cavernosi blend posteriorly with the perineal body; encircling the vaginal bulbs and vestibule, each divides, according to Henle, into three slips, one of which may be traced to the posterior surface of the bulb, another to the lower surface of the corpus cavernosum clitoridis, while the third is lost in the mucous membrane of the vestibule. The function of these muscles is *not*, as is frequently stated, to contract the vaginal outlet (which office is performed by the anterior portion of the levator ani), but to compress the bulbs. The transversus perinei are sometimes divided into two layers, a superficial and a deep, separated by the anterior layer of the triangular ligament. They appear almost invariably in actual dissections as pale, indistinct slips, which spring from the rami of the ischium and anterior layer of the triangular ligament, and are lost in the perineal body. The anal sphincter, which has been described, blends anteriorly with the muscles above mentioned; some of its peripheral fibres are apparently continuous with those of the bulbo-cavernosi. The pubo-coccygeus (anterior portion of the levator ani), as viewed from below, lies deeper than the preceding muscles (*i. e.* above them), as it is *behind* the perineal septum (Fig. 78). It encircles the vagina, and its inner fibres curve inward behind that canal to enter the perineal body behind the lower edge of the septum. When traced farther backward they surround the rectum in a similar manner between the two sphincters, and blend with the terminal fibres of the longitudinal layer of the rectum.

The erectores clitoridis are not properly included in this dissection, and are described with the clitoris.

Removing the bulbo-cavernosi and the vaginal bulbs, which rest upon the anterior layer of the triangular ligament, the latter is seen to be perforated by branches of the pudic arteries and nerves and by

FIG. 78.



Perineal Septum, posterior view (Savage); S, posterior surface of symphysis; U, urethra; V, vagina; 1, pubic attachment of bladder; 2, pubic attachment of levator ani (pubo-coecygeus); 3, line of attachment of obturato-coecygeus; 4, pudic vein; 5, urethro-pubic plexus of veins; 6, posterior surface of septum; 7, median portion of pubo-coecygeus, entering perineal body at lower edge of septum.

the communicating veins which extend from the bulbs and clitoris to the vesical plexuses. When the layer itself is detached, the following structures are exposed: The urethra, surrounded by the compressor urethræ¹ of Guthrie, the constrictor vaginae of some authors;² the deep transversus perinei, the vulvo-vaginal glands, internal pudic vessels and nerves, dorsal vein and nerve of the clitoris, and artery of the bulb. The two former muscles are described by Heath as forming a figure-of-8 around the urethra and vagina, being attached anteriorly to the posterior aspect of the pubic arch, and entering the perineal body behind. Behind the above structures lies the deep layer of the tri-

¹ Ellis, *Trans. Roy. Med.-Chir. Soc.*, vol. xxxix., 1856.

² Why not include these two muscles in one as the sphincter vaginae of Luschka?

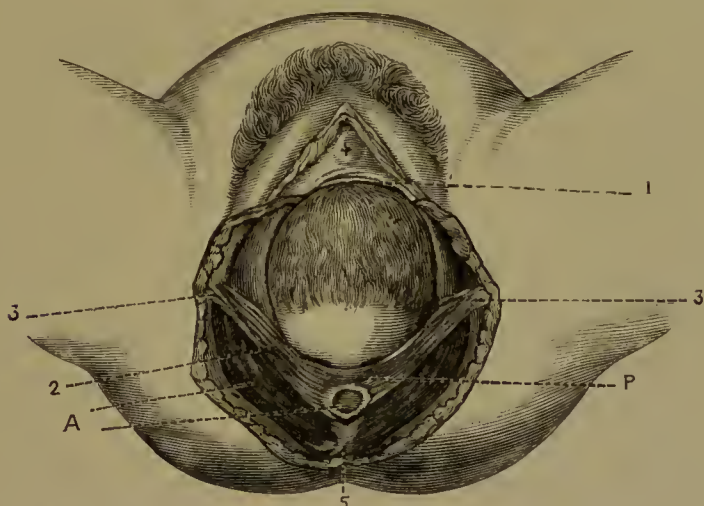
angular ligament, belonging to the pelvic fascia, which was studied from above.

The vascular and nervous supply of the urethral triangle may be dismissed in a few words, since it presents no special points of difference in the two sexes. We are most concerned here with the vessels and nerves of the perineal region. The arteries spring from the internal pudics, which, after re-entering the pelvis through the lesser sacro-sciatic foramina (each artery being accompanied by two veins and a nerve), skirt the outer edges of the ischio-rectal fossæ, ascend the pubic rami, perforate the posterior layer of the triangular ligament, and continue to ascend between the two layers until within a short distance of the symphysis, where each terminates in the artery of the corpus cavernosum and the dorsal artery of the clitoris. The inferior or external hemorrhoidal arteries of the pubic are two or more small branches which leave the main vessel in front of the tuberosity, cross the ischio-rectal fossa, supply the external sphincter and the posterior part of the levator ani, and terminate by anastomosing with the vessels of the opposite side beneath the skin around the anus and in the superficial perineal fascia. The superficial perineal branch arises in front of the hemorrhoidal, pierces the deep perineal fascia, crosses the transversus perinei muscle, and extends forward beneath the superficial fascia to the vulva. It sends deep branches to the surrounding muscles, and superficial twigs to anastomose with those from the hemorrhoidal arteries. The transverse perineal branch perforates the posterior layer of the triangular ligament, and follows the course of the transversus perinei muscle inward, where it divides into branches that anastomose with those of the opposite side at the perineal centre beneath the deep layer of the superficial fascia. It may send branches to the corresponding vaginal bulb and gland of Bartholin. The veins of the perineal region communicate freely with one another and with the hemorrhoidal and labial plexuses, as well as with the bulbs; they accompany their respective arteries and terminate in the pudic veins. The lymphatics unite with the vessels from the external genitals to enter the inguinal glands.

The perineal body is supplied exclusively by branches of the pudic nerve; the pudendal branch of the small sciatic may send a twig which enters the superficial perineal fascia. The inferior hemorrhoidal branch of the pudic accompanies the vessels of the same name and has a similar distribution; the superficial perineal branches supply the vestibular area, the labia, and integument covering the base of the perineal body, communicating with the hemorrhoidal branch. The deep perineal nerve accompanies the superficial vessels and supplies the labia, vaginal bulbs, and glands, sending special twigs to the perineal and urethral muscles.

From this brief account of the structures in immediate relation with the perineal body it will be seen that, aside from the support which it gives to the anterior rectal wall, its principal office seems to be to form a *point d'appui* for the muscles and fasciæ which have been mentioned as constituting the superficial portion of the pelvic floor, and that the only way in which it can be said to furnish support to the internal genital organs is through its connection with the floor. That its relation with the deeper structures is not particularly intimate will be inferred from the fact that it receives only a few of the more internal fibres of the pubo-coccygei. Its base, on the other hand, is closely connected with the superficial portion of the floor, especially with the strong ischio-perineal ligament, which in parturition bears the brunt of the expulsive force during the emergence of the child's head (Fig. 79).

FIG. 79.



Relations of the Muscular Floor of the Pelvis to the Presentation at the Last Stage of Parturition: 1, upper margin of vaginal ring; 2, ischio-perineal ligament and superficial transverse muscle; 3, their attachments to the tuberosities of the ischium; 4, lower part of the pubo- and obturato-coccygeus muscles; *p*, perineal body; *a*, anus.

Want of space forbids our entering upon a discussion of the interesting subject of the structural anatomy and physics of the pelvic floor, which have been so admirably treated by the Edinburgh authors, from whom we have borrowed freely. It may be stated, briefly, that, according to Dr. Hart's theory,¹ the floor may be divided into two segments, a pubic, including the bladder, urethra, anterior vaginal wall, and peritoneum covering the bladder, and a sacral, made up of the rectum, perineal body, and posterior vaginal wall. Ranney, following a suggestion of Foster's,² offers a different division, which is rather better. He includes in the pubic segment the parts above mentioned plus the uterus and utero-sacral ligaments. The pubic segment is then attached

¹ *The Structural Anatomy of the Female Pelvic Floor*, 1881.

² Made in a paper on "The Mechanical Action of Pessaries," *Am. Gyn. Trans.*, 1881.

somewhat loosely to the symphysis, more firmly to the sacrum. Parallel with the former is the sacral segment, which is "firmly dovetailed into the sacrum and coccyx." Without going into details, it will at once be evident that the sacral segment, as a whole (including the perineal body), acts as a support to the pubic, and thus (acting with the utero-sacral ligaments) maintains the uterus in its normal position.

The writer can subscribe only in part to Foster's positive statement, that "except to resist extreme displacements of the organ the broad ligaments, the round ligaments, the bladder, the rectum, and the perineum take *no* part among the supports of the uterus." It seems better to regard the uterus, as well as the vagina, as upheld by the "compact, unbroken pelvic floor," the perineum being "only a small, though strong, part of the sacral segment."

Another point which ought not to be overlooked in this hasty glance at the architectural anatomy of the pelvic floor has reference to its projection beyond the conjugate of the outlet. This has been studied by several, especially by Foster, to whose paper the reader is referred for details on this subject, as well as for careful measurements of the bony pelvis.¹ His average estimate of this projection is 2.5 cm., the patient being semi-prone.

Regarding the perineal body as simply a portion of the sacral segment of the pelvic floor, we shall be disposed to attach less importance to lacerations of the body which do not involve the sphincter. The mechanism of prolapsus becomes much more satisfactory when viewed in connection with the theory that "the chief support (of the uterus) is the compact, unbroken pelvic floor," while the gynecologist now regards the useful rather than the beautiful in the performance of perineorrhaphy.

Although Dr. Emmet was not the first to affirm the insignificance of the perineal body as a support, he has deduced the practical lesson that laceration of the perineum alone impairs but little the integrity of the uterine support, whereas overstretching, or tearing of, the fascia or muscles (*levator ani*) of the floor at their attachment to the vagina, as the result of parturition, at once disturbs the delicate adjustment of the pelvic organs. This theory, so correct logically, has, unfortunately, not yet received confirmation through careful dissections. Assuming that the injury in such cases involves the deeper tissues, and that it is not repaired by closing the perineum alone, it remains to inquire if the new operation proposed by Dr. Emmet does fulfil the indications. Granting that the tissues of the pelvic floor are lacerated, does the operator remite the torn ends by passing his sutures blindly through the posterior vaginal wall, or is the operation simply a modified posterior colporrhaphy, the ultimate result of which is simply to narrow the vagina by the removal of redundant tissue?²

¹ *Am. Journ. Obstetrics*, vol. xiii. p. 30.

² *Comp. Emmet, op. cit.*, ch. xx.

MALFORMATIONS OF THE FEMALE GENITALS.

BY HENRY J. GARRIGUES, A. M., M. D.,
NEW YORK.

ALL malformations are referable to one of two large classes. The first of these comprises those cases which are due to an *excess* of growth, which again may be a mere *hyperplasia* or uncommon size of an organ brought on by an increase in the number of constituent histological elements, or *hypertrophy*, by which is designated the condition in which the elements themselves are enlarged; or, on the other hand, the excess may be characterized by a *multiplication* of organs. To the other much more numerous and important class belong all those cases which are referable to an *arrest of development*.

Why an organ should increase in size beyond the ordinary limits, or why it should appear in a larger number than usual, is not clear. We must be satisfied with stating the fact that sometimes organs do obtain larger dimensions than in the majority of cases. Still less can we understand in most cases how a multiplication of organs is brought about, apart from those cases where there evidently is a double foetus, parts of which have not been developed, while the two foetuses have grown together. We do not know by what process sometimes a child has six fingers instead of five, four breasts, etc.

In the second class our intellect finds more satisfaction. What formerly was a chaotic mass of different freaks of Nature has, to a great extent, become a system of well-connected links which are easily understood as soon as we study them in the light of embryological development as described in the preceding article.

THE OVARIES.

Sometimes the ovaries in newborn children are found twice as large as normal. In some cases it is a simple hyperplasia, with an even increase of all the constituent parts, but oftener we find a preponderance of connective tissue and a more or less complete disappearance of Graafian follicles—a condition which may be looked upon as the result of a foetal inflammation.

Supernumerary ovaries are, according to Beigel, not rare. He found them 23 times in 500 autopsies of adult women. They were only small bodies, of the size of a pea or a hazelnut, but showed on microscopical examination the complete structure of the ovarian tissue, especially follicles, the characteristic element of an ovary. They had thin pedicles, and were found near the peritoneal border of the normal ovary, and once on the surface of the broad ligament.

Sometimes the ovaries present more or less deep fissures. In other cases two parts have been found bound together with a ligament, and in a case of Grohe there was a large ovary on one side and two small ones on the other, the inner one of which was bound to the uterus by an ovarian ligament, the outer one not (Puech). This is probably only a further division of one ovary.

Olshausen removed a large multilocular ovarian cyst which was bound by a pedicle to the uterus, and yet two normal ovaries were found in their places imbedded in a mass of inflammatory adhesions.

Winckel has photographed a somewhat similar case to Grohe's, and an unique case in which a supernumerary ovary as large as a normal ovary was bound to the uterus by a separate ovarian ligament.¹

The possibility of the presence of a supernumerary ovary must be borne in mind as one explanation of the occurrence of pregnancy after double ovariectomy, a case of which occurred in Norway some years ago (Leopold Meyer).

Both ovaries may be *absent*—a condition commonly only found in the rare cases of total absence of the uterus. The congenital absence of the ovaries entails absence of menstruation, but the female type and sexual appetite have been found normal. One ovary may be totally absent in an individual with a one-horned uterus.

That the ovaries are not found in their usual place is not a sufficient proof of their absence. In consequence of a deficient descent they may be found in the lumbar region—a condition which, however, is very rare, and has only been found in connection with great arrest of development in other respects.

Sometimes the ovary is found in the inguinal canal, or even in the corresponding labium majus. This may be due to a faulty development. If the round ligament, instead of acquiring its normal length, stays short, it drags the tube and ovary and sometimes the horn of a bicornous uterus through Nuck's canal; that is, the prolongation from the peritoneum which surrounds the round ligament during its passage down through the inguinal canal to its attachment to the mons Veneris and the large labia.

More rarely, the ovary alone, without the tube, is found in such a congenital hernia. That it can come down during intra-uterine life is

¹ Winckel's *Pathologie der Weiblichen Sexualorgane*, p. 28 and table xxxiv. fig. 7.

easily understood when we examine the relative size of the ovary and the canal. From the fourth to the sixth month of fœtal life the latter is 6 millimeters wide (Puech), and in the fifth month the ovary is 1.6 millimeters thick and 2.4 millimeters high (Kölliker). It is of so much greater importance to bear in mind that the ovary can be found in these unusual localities, as it has here become the seat of diseases, such as cystic or cancerous degeneration, requiring surgical interference.

Sometimes one or both ovaries become severed from the genital apparatus by fœtal inflammation, and may either be found adherent to some other part or floating free in the abdominal cavity.

More common than the total absence of ovaries is a *rudimentary development* of these organs, either with preservation of Graafian follicles or with total loss of these latter, in which case the ovary is only formed by a mass of connective tissue. As a rule, the rudimentary development of the ovaries is combined with a similar deficiency in the formation of the uterus; but sometimes well-developed ovaries are found together with the arrest of development of the uterus; and, on the other hand, the atrophy of the ovaries may be found in women with well-developed uterus and external genitals. Sexual desire may be present, but such women do not menstruate.

Virchow has shown that the rudimentary development of the ovaries is sometimes combined with congenital faults in the large blood-vessels, especially stenosis of the aorta; and Morel has pointed out the frequent combination of a rudimentary development of the ovaries with a similar deficient development of the nerve-centres, especially in cretins and idiots.

THE FALLOPIAN TUBES.

The oviducts are sometimes unusually large. In most cases this increase is the consequence of the presence of a tumor with which the tube is more or less intimately connected. But even in the absence of all other abnormalities the tubes have been found 16 or 17 centimeters (about $6\frac{1}{2}$ inches) long.

Another kind of excessive formation is constituted by *supernumerary ostia* surrounded by fimbriæ. These openings may be found on one or both tubes. They are always situated at the upper surface and near the abdominal end. How they are produced is not yet known. If Waldeyer's views about the formation of the Fallopian tube as an originally open canal (see p. 68) were true, these openings might be looked upon as the result of an arrested development; but the formation of the fimbriæ which surround them would still place them among malformations by excess.

The tubes may be *absent*—a condition which is usually combined with a defect of the uterus, or at least with a solid, uncanalised uterus.

The absence of one oviduct is found in cases of a one-horned uterus. In one case the tube on one side was absent, although the uterus was well developed.

All these varieties are easily understood when we remember that the tubes are only the upper part of the Müllerian ducts, a malformation or destruction of which must result in corresponding deficiencies in the Fallopian tubes.

Sometimes the tubes are only represented by feeble streaks of connective or muscular tissue at the upper edge of the broad ligaments. At other times the tubes, in their whole course or in some part of it, are represented by solid strings. This condition is explainable when we remember that according to the generally accepted doctrine the Müllerian tubes begin as solid filaments, in which there subsequently appears a bore.

At the fimbriated end of the tube is often found a pea-shaped cyst called *Morgagni's hydatid*. Its interior is lined with ciliated epithelium like that of the tube, and it contains a clear fluid. Formerly this cyst was taken to be the upper end of Müller's duct, but, as we have seen, this is never closed. Besides, this cyst is only found in one out of five women (De Sinéty). It is therefore now looked upon as a pathological formation. Occasionally it becomes enlarged: I have myself seen it the size of an English walnut.

THE UTERUS.

In studying the malformations of the uterus, more than in any other part of this disquisition, it is of the greatest importance to keep in mind the teachings of the history of foetal development. If we remember that this organ is formed by the fusion and further development of the middle parts of the Müllerian ducts, which themselves are originally solid filaments, we will easily understand that that part of those ducts which should form the womb may have originally been absent or may have been destroyed, or that the filaments continue to be solid columns without bore, or that the muscular tissue which in the course of time should surround these tubes fails to be produced, or that fusion between the tubes does not take place at all or does so only imperfectly, or that one tube undergoes its regular development while the other lags behind or is altogether absent. On the other hand, an excess of development may take place. Thus we will have to consider the following conditions:

A. Excessive development.

B. Arrest of development during the first half of intra-uterine life:

I. Absence of uterus.

II. Rudimentary uterus.

- III. Uterus duplex separatus.
- IV. Uterus unicornis.
- V. Uterus bicornis.
- VI. Uterus septus.
- VII. Uterus subseptus.
- VIII. Atresia uteri.
- C. Arrest of development during the second half of intra-uterine life :
 - I. Uterus fœtalis and uterus infantilis.
 - II. Uterus pubescens.
 - III. Uterus incudiformis.
 - IV. Uterus parvicollis or acollis.
 - V. Ante flexion.
- D. Irregular development :
 - I. Obliquity.
 - II. Lateroposition.
 - III. Anteposition.
 - IV. Postposition.
 - V. Hernia uteri.
 - VI. Abnormal communications.

A. EXCESSIVE DEVELOPMENT AND PRECOCITY.

Sometimes the uterus of newborn children has been found to equal that of a girl near puberty, not only in size and mass, but in the proportions between the neck and the body. (See p. 90.) In many cases menstruation has begun in early childhood. Kerkring saw it appear at the birth of the child and continue regularly. Langlade and Cummen observed it between the eighth and the twentieth day of the child's life (Klob). Bouchut has published the history of a child four years old who had well-developed breasts, pubes, and external genitals, and who had menstruated regularly since it was twenty-two months old.¹

Prochowniek has proved by post-mortem and microscopical examination that such a case of precocious menstruation was combined with, not to say depended on, a precocious development of the uterus and the ovaries. The child was scrofulous and rickety, three years old, and had menstruated regularly, for the last two years, three days in every four weeks. The child died immediately after a menstruation. The breasts were only a little developed, but on either side a small movable lump of glandular tissue was found. The hair-growth was somewhat more abundant than normal. The vagina measured 5 centimeters, the uterus 4 cm., two of which belonged to the body ; that is, twice the normal depth. The inside had a greenish color and was covered with a thin

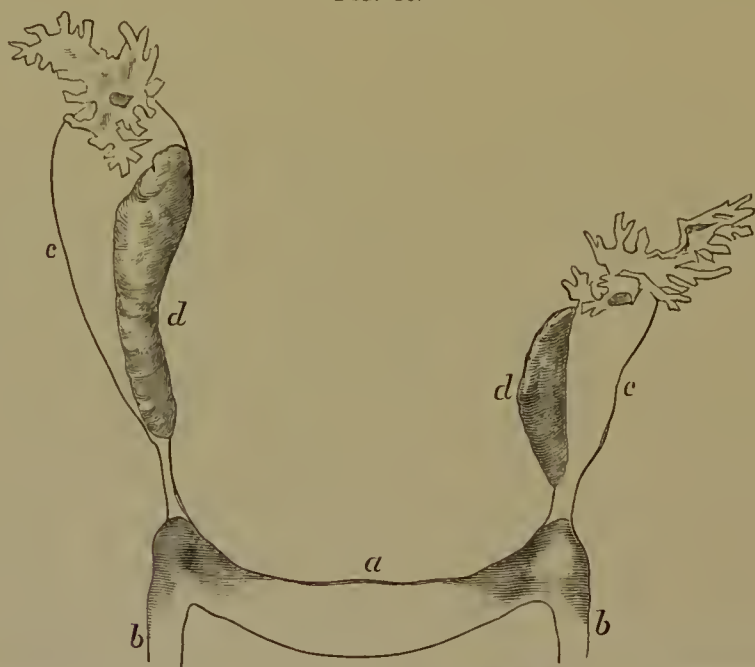
¹ *Paris Médical*, Dec. 22, 1876.

greenish-yellow mucus, although the parts were entirely fresh. Microscopical examination showed that the superficial layer and the mucus were composed of glandular tubules, epithelial lining, and detritus mixed with numerous red blood-corpuscles, innumerable leucocytes, and a few pus-corpuscles. The right ovary measured 2 cm. in length, 1.3 cm. in height, and 0.3 in thickness; the left was 3.5 long, 1.5 high, and 0.25 thick. These long and high but thin ovaries showed notches and puckering, as those of a senile woman. In the left was found a freshly-ruptured follicle in the first stage of transition into a corpus luteum. Microscopical examination showed nearest the surface a zone of young follicles, and in the deeper layers much larger follicles, while the stroma was remarkable for its richness in blood-vessels compared with that of another child of the same age.

B. ARREST OF DEVELOPMENT DURING THE FIRST HALF OF INTRA-UTERINE LIFE.

I. ABSENCE OF THE UTERUS.—It has often been claimed that the uterus was absent in cases in which such an assertion was not warranted

FIG. 80.

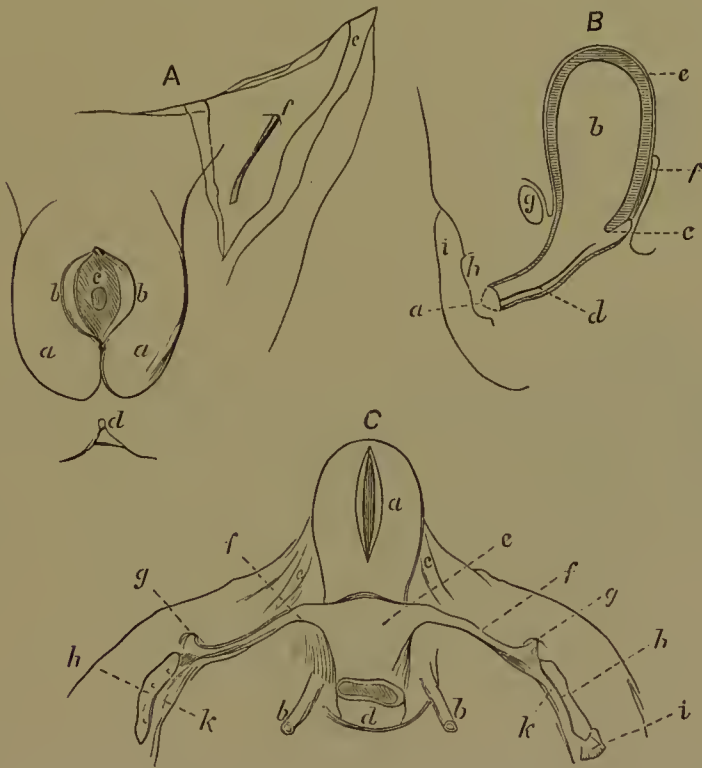


a, ribbon-shaped rudiment of the uterus; *b, b*, the round ligaments; *c, c*, Fallopian tubes; *d, d*, ovaries. (From Kussmaul, after Nega.)

by the examination. All observations which regard living persons must be eliminated, as the womb may be so rudimentary as to escape detection even by the most skilful examiner. The total absence of the womb

can only be proved by a careful post-mortem examination; and even then the observer is liable to be led astray. He must especially think of the possibility that the supposed woman be really a man with female external genitals and hidden testicles. He must furthermore distinguish a rudimentary uterus from a Fallopian tube, the limit between the two being the point of insertion of the round ligament. The com-

FIG. 81.



A, External View: *a, a*, the labia majora, that lay in close contact, but here are drawn apart; *b, b*, the labia minora; *c*, the opening of the urogenital sinus; *d*, anus, with normal rectum; *e*, flap of skin; *f*, the external opening of the left iliac canal, from which protrudes the round ligament, which spreads in the adipose tissue. B, Sagittal Section: *a*, urogenital canal, which here almost exclusively represents the urethra; *b*, bladder; *c*, small blind pouch at the upper end of the urogenital canal; *d*, fine ridge detaching itself on both sides from the wall of the urogenital canal, and forming a rudimentary partition of the same into an urethra and a vagina; *e*, peritoneal covering of bladder; *f*, section of the flat uterus, over which the peritoneum is extended without forming any deep pouch between it and the bladder: it is bound to the bladder by means of loose connective tissue; *g*, symphysis pubis; *h*, labia minora; *i*, labia majora. C, View from the Peritoneal Cavity, behind the Uterus: *a*, bladder, incised; *b, b*, ureters; *c, c*, umbilical arteries; *d*, rectum; *e*, very flat uterus, the lower part of which has not been developed; *f, f*, the round ligaments, or rather horns, of the uterus; *g*, internal opening of the inguinal canal, through which the round ligaments go to the adipose tissue of the labia minora; *h, h*, very small and flat ovaries; *k*, peritoneal fold in which the ovaries are imbedded. (From Kussmanl, after Langenbeck.)

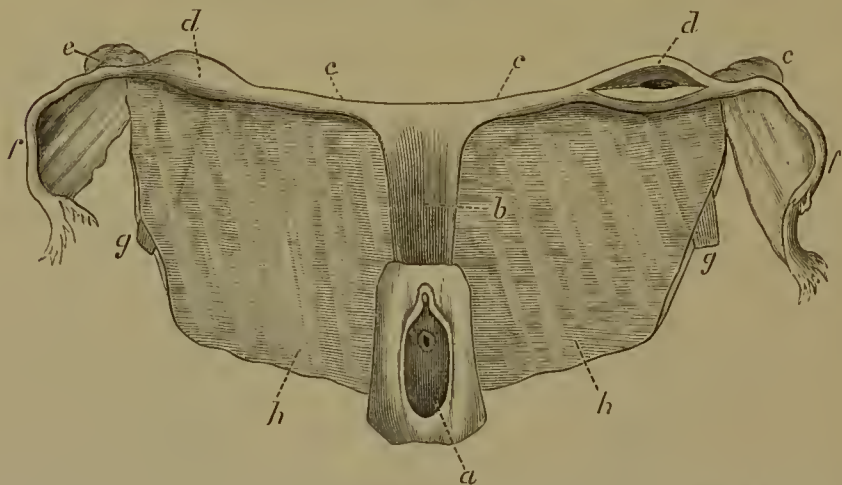
plete absence of even a rudimentary uterus is rare. In our own literature we have two cases examined post-mortem by Dr. I. E. Taylor, and there are a few other authentic cases on record.

The absence of the uterus may be found alone, but is more commonly

combined with other developmental faults of the genitals or other parts of the body. Thus in J. T. Whittaker's case, in which utero-gestation had progressed six months, the external genitals were only represented by a rudimentary clitoris; the urethra and the anus were absent, the ovaries atrophic, and the tubes devoid of fringes. In a recent case, reported by Coen of Bologna, of a girl born at eight months' gestation, the absence of uterus and vagina was combined with absence of the kidneys and deficient development of the eyeballs, while the external genitals, the tubes, and ovaries were normal.

II. RUDIMENTARY UTERUS.—The subject of the malformations of the uterus has become considerably complicated by the fact that different authors use the same term for different things or designate the same conditions by different expressions. In the following pages we will use Kussmaul's names, his work being by far the most important,

FIG. 82.



Uterus Bipartitus of a servant-girl sixty years of age: *a*, vagina, about one inch deep, and ending at the anterior wall of the rectum, above the internal sphincter; *b*, connective tissue interspersed with muscular fibres, simulating the shape of a uterus; *e*, *e*, fleshy strings representing the horns of the uterus; *d*, *d*, swellings of the size of a bean, one cut open and showing a cavity of the size of a lentil and lined with mucous membrane; *c*, *c*, rudimentary ovaries; *f*, *f*, Fallopian tubes; *g*, round ligaments; *h*, broad ligaments. (From Kussmaul, after Mayer.)

but at the same time add those used by others, and indicate when Kussmaul's terms are used by others in a different sense.

1. In some cases in the place of the uterus there has only been found a globular, solid, fibrous mass of the size of a hazelnut.

2. In Nega's case (Fig. 80) the uterus was reduced to a narrow flat muscular band, without any cavity, forming a transverse arch in the pelvis.

3. In a case described by Langenbeek (Fig. 81) the uterus is likewise formed by a solid flat, muscular mass, as in Nega's, but the mass

has the shape of the body of the uterus, and from its corners starts on either side a round string which enters the inguinal canal, and which consequently represents partly the horn of the uterus and partly the round ligament. There is no neck.

4. A transition between the solid and hollow forms of rudimentary wombs is formed by what was first described by Prof. Mayer of Bonn under the name of *uterus bipartitus*¹ (Fig. 82). This kind of rudimentary uterus is not so extremely rare as those hitherto considered, which are only represented by one or two cases. It is characterized by the presence, between the bladder and the rectum, of a body which has somewhat the shape of a uterus, and which is composed of connective tissue with interspersed muscular fibres. At the upper end it sends off to both sides a cord of similar composition, which, at the point of insertion of the round ligament, forms a small muscular swelling, which either is solid or contains a small cavity lined with a mucous membrane. These cords represent the horns of the uterus. With its lower end the fibro-muscular body rests on the cul-de-sac of a short vagina or on the solid fibrous column which replaces that organ.

The late E. R. Peaslee has described a solid uterus in the first volume of the *Transactions* of the American Gynecological Society (Fig. 83).² It was taken from the body of a woman twenty-four years old. "A hard conical nodule was found on introducing the hand through the abdominal incision on each side, the two meeting behind the bladder at their apices in a pretty firm mass of tissue. The finger introduced into the vagina was arrested at about three inches, and above this point to the union of the nodules above, a distance of about one and a half inches, nothing existed in the way of fibrous cords, nor the slightest canal except some blood-vessels. From the outer and anterior portion of the nodules the round ligaments were seen to be given off and to take their normal course to the internal abdominal ring." The nodules showed no cavity. The figure which accompanies the description shows that the tissue which formed the connection between the two nodules had the form of the intermediate part of a uterus, and it is stated that that likewise was solid.

The *uterus bipartitus* may have a neck. Then there are three more

¹ Lefort applies the name *uterus bipartitus* to any kind of double uterus, *uterus diductus* (i. e. *didelphys*), *uterus bicornis*, and *uterus globularis* (i. e. *septus*). *Uterus bipartitus* (Mayer, Kussmaul) is by others designated as *uterus bifidus*. On the other hand, the term *bifid* is by Playfair (*Science and Practice of Midwifery*, London, 1876, vol. i. p. 43) used as a synonym of *double*, and applied to a *uterus bicornis unicolis*.

The term *double uterus* is used in very different senses, and does not designate any particular kind of malformation. It ought only to be used as a general term, comprising the *uterus didelphys*, the *uterus bicornis duplex*, and the *uterus septus*.

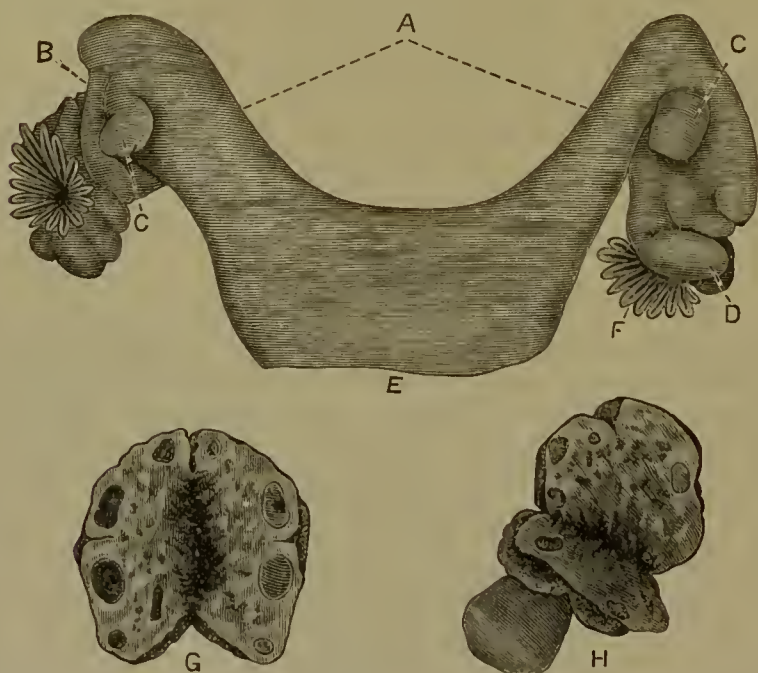
² *Am. Gyn. Trans.*, 1876, i. 347.

developed muscular, perhaps hollow, parts united by more membranous or cord-like parts.

5. On the other hand, there may be two well-developed horns separated by an incomplete septum, without neck (*uterus bicornis acollis*).

6. *Vesicular Uterus*.—The rudimentary uterus may only consist of a membranous vesicle with or without neck. In none of the cases of

FIG. 83.



A, the two unequal solid masses representing the cornua and part of the corpus of the bipartite uterus; *E*, the remainder of the organ, also solid, the fundus of the empty bladder lying on a level with its lower border; *C, C*, the commencement of the two round ligaments; *B*, the right Fallopian tube, the left being crossed by the line ascending from the left round ligament; *D*, stump whence the left ovary had been removed, that of the right side being behind the convolutions of the Fallopian tube; *F*, pavilion of the left tube, below the latter: the right pavilion is seen to be higher than the left, the left ovary having been one inch lower in the pelvis and further back than usual; *G*, right ovary laid open, showing gray spots of colloid degeneration, ovisacs, and colloid cysts; *H*, left ovary, showing cysts filled with colloid, and the polypoid mass on its lower extremity—namely, a colloid cyst into which hemorrhage had occurred. (From Peaslee.)

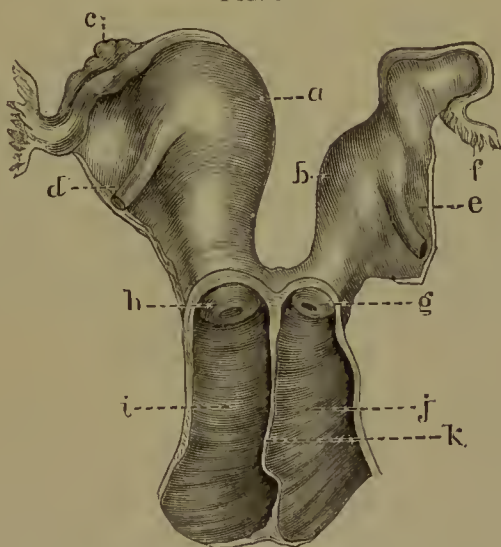
rudimentary uterus, the authenticity of which has been proved by autopsy, did the women menstruate, but they suffered often from monthly molimina, and in some few cases, in which it was impossible on the living to find any uterus, there was a periodic discharge of blood from the genitals.

III. UTERUS DUPLEX SEPARATUS, S. DIDELPHYS (*δῖς*, twice; *δελφύς*, womb; *Uterus diductus*, Lefort).—This is the type produced when the Müllerian tubes do not even come in contact with one another in that part of their course in which they ought to melt together and form the

uterus. Consequently, we have two entirely separate uteri, but each of them represents only one-half of the organ. Above, it joins a Fallopian tube; below, each cervix may open into a separate vagina, or the latter organ may be more or less defective. The *uterus duplex separatus* has mostly been found in stillborn children or such as died soon after birth, but Ollivier's specimen, which we reproduce here (Fig. 84), came from a woman who was forty-two years old and had been pregnant five times. Dirner's patient was twenty-seven years old and had had one miscarriage.

In the *American Journal of Obstetrics* (1876, vol. ix. p. 651) is found a report of a case related to the New York Obstetrical Society by the

FIG. 84.



Uterus Didelphys: *a*, right cavity; *b*, left cavity; *c*, right ovary; *d*, right round ligament; *e*, left round ligament; *f*, left tube; *g*, left vaginal portion; *h*, right vaginal portion; *i*, right vagina; *j*, left vagina; *k*, partition between the two vaginæ. (From De Sinéty, after Ollivier.)

late Dr. E. R. Peaslee, under the heading "Uterus didelphys septus and Vagina septa;" but since it is stated that "the septum ran through up to the fundus uteri," and that "the uterus was not bicornis," it is evident that this was not a uterus didelphys, but a uterus septus duplex, which will be described below.

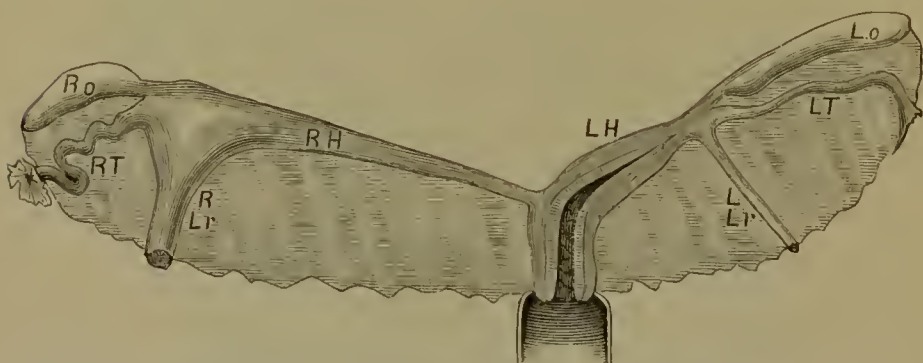
Near the uterus didelphys stands the uterus described by Cooper Rose:¹ On either side of the pelvis, resting on the rami of the ischia, were two bodies three-quarters of an inch in length, broad below and tapering above, separated from one another by a space of more than an inch, not connecting with one another or externally. The body on the left side, being cut open, was found to be one lateral portion of the uterus, having a central cavity lined with mucous membrane, and com-

¹ *Lond. Obst. Trans.*, 1874, vol. xv. p. 128.

municating at its upper end with a pervious Fallopian tube having attached to it a small ovary and terminating in a fimbriated extremity. There was no cervix or vagina to this portion. On the body on the right side existed a cervix and vagina, the latter without any external opening. This side had a Fallopian tube and ovary like the other. In this case, then, the Müllerian ducts have remained separate; the right remained imperforate at its lower end; of the left, the lower part, which should have formed the cervix and vagina, had not been formed or had been destroyed.

IV. UTERUS UNICORNIS.—The one-horned uterus (Fig. 85) is formed by the development of one of the Müllerian tubes, while the other is absent or rudimentary. The one-horned uterus is always very long in

FIG. 85.



Uterus Unicornis: *LH*, left horn; *LT*, left tube; *Lo*, left ovary; *LLr*, left round ligament; *RH*, right horn; *RT*, right tube; *Ro*, right ovary; *RLr*, right round ligament. (From Schroeder.)

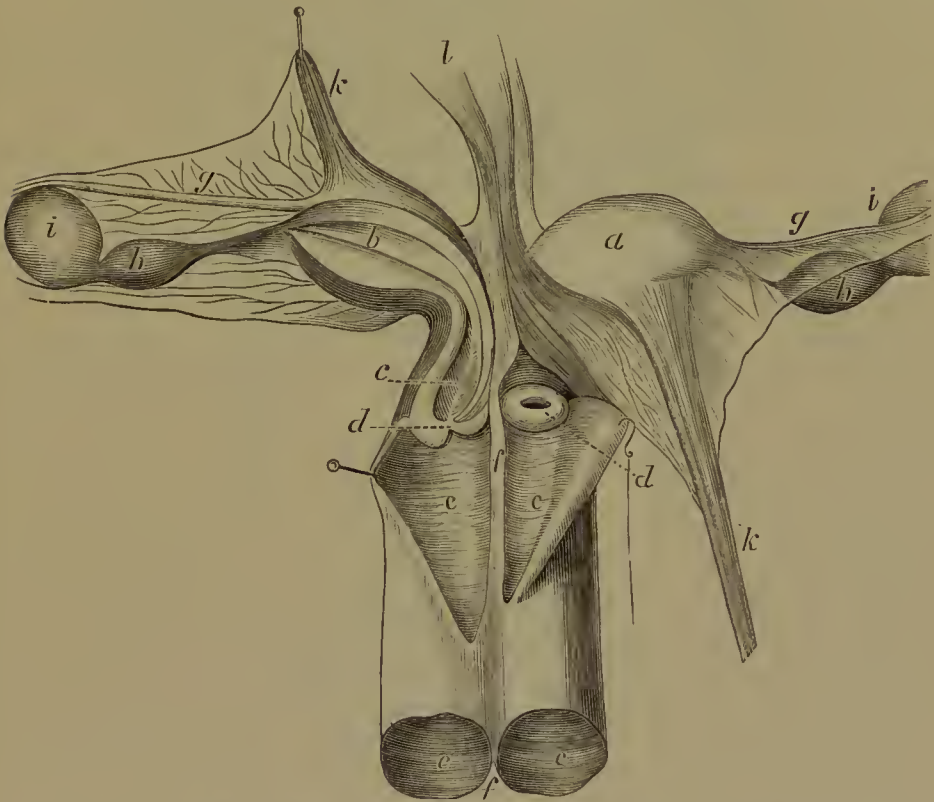
proportion to its width, forms a curve with the concavity turned outward, and ends in a point from which start a Fallopian tube, an ovarian ligament, and a round ligament. It has no fundus.

Pregnancy in a strictly one-horned uterus does not vary materially from that in a normal one. If there be a rudimentary horn, both horns develop a decidua, and a foetus may be formed in both or in either of them. If the development takes place in the rudimentary horn, there is great danger that it will not be able to develop muscular substance enough for sheltering the foetus through the whole normal period of utero-gestation. As a rule, the rudimentary horn is ruptured by the increasing bulk of the foetus. Such cases may be taken for a rupture of the Fallopian tube if the observer does not bear in mind that the round ligament offers a safe landmark. If the foetal sac is situated inside of the ligament, it belongs to the uterus; if developed outside of it, it is tubal. In very rare cases menstrual blood has been found to collect in the rudimentary horn, so as to form a unilateral hemato-metra.

V. UTERUS BICORNIS.—When the Müllerian ducts stay more or

less separated from one another in that part of their course which corresponds to the upper part of the uterus, this organ is at its upper end divided into two horns. As to the lower part of the uterus, it may vary in development. In some cases there are two cavities entirely separated from one another by a partition and having each a cervix (*uterus bicornis duplex*, Figs. 86 and 87). In other cases the separation is only found in the body of the uterus, while below the

FIG. 86.



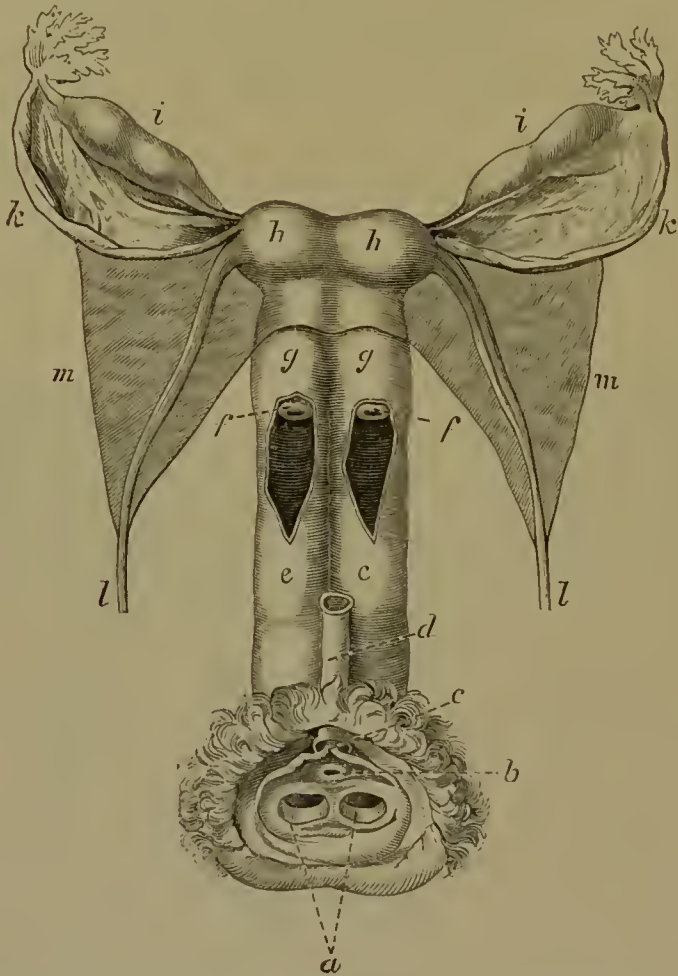
Uterus Bicornis Duplex, from a virgin thirty years old: *a*, left horn; *b*, cavity of right horn; *c*, right cervical canal; *d, d*, external orifices; *e, e*, the two vaginal canals; *f*, partition between the vaginal canals; *g, g*, tubes; *h, h*, ovaries; *i, i*, cysts of the ovaries; *k, k*, round ligaments; *l*, suspensory ligament of uterus or recto-vesical ligament. (From Kussmaul, after Cassan.)

Müllerian tubes have been fused together in the normal way, so as to form a single cervix (*uterus bicornis unicollis*, *s. infra simplex*, *s. semi-duplex*, Fig. 88).

A still smaller degree of separation is found in the form of uteri which Kussmaul calls *uterus arcuatus* (*uterus cordiformis*, *utérus échan-cré cordiforme*, Barth). On the outer surface (Fig. 89) there is only a shallow notch between the two horns, as in some forms of uterus bicornis duplex, and inside the septum is reduced to a ridge running over the fundus in an antero-posterior direction. It looks as if the

fundus had been bent inward toward the cavity in the median line, by which disposition both the whole uterus and its cavity acquire a shape somewhat like the heart on playing-cards.

FIG. 87.

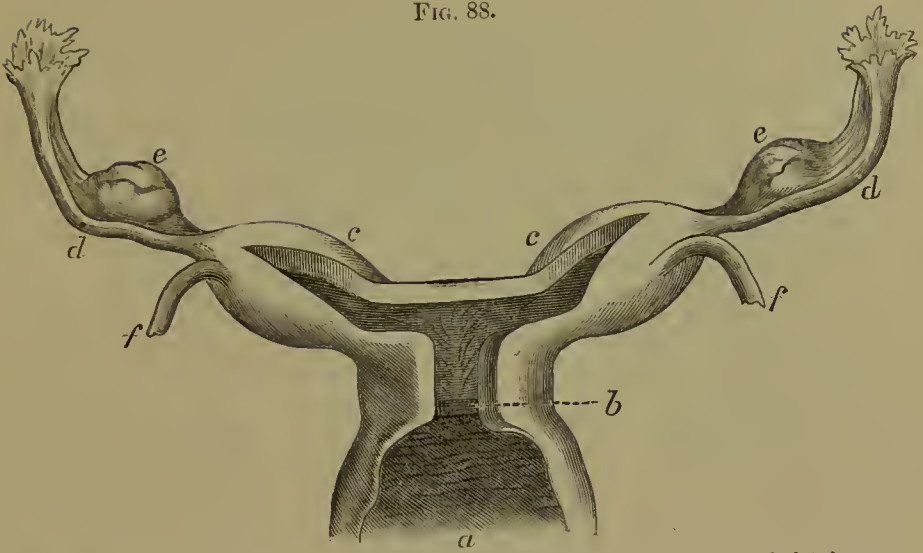


Uterus Bicornis Duplex: *a*, double entrance to vagina; *b*, meatus urinarius; *c*, clitoris; *d*, urethra; *e, e*, double vagina; *f, f*, external orifices of uterus; *g, g*, double cervix; *h, h*, bodies and horns of uterus; *i, i*, ovaries; *k, k*, tubes; *l, l*, round ligaments; *m, m*, broad ligaments. (From Kussmaul, after Eisenmann.)

VI. UTERUS SEPTUS (*Utérus cloisonné*, Cruveilhier; *Uterus bilocularis*, Rokitansky; *U. globularis*, Lefort).—Much rarer than the bicornuted uteri are those which in consequence of the normal development of the fundus outwardly present the appearance of a single uterus, but in which the cavity is divided by a more or less complete longitudinal septum into two halves.

If the partition is complete, this kind is called *uterus septus*, or by redundancy *uterus septus duplex* (Fig. 90); if it is incomplete, we have a *uterus subseptus*.

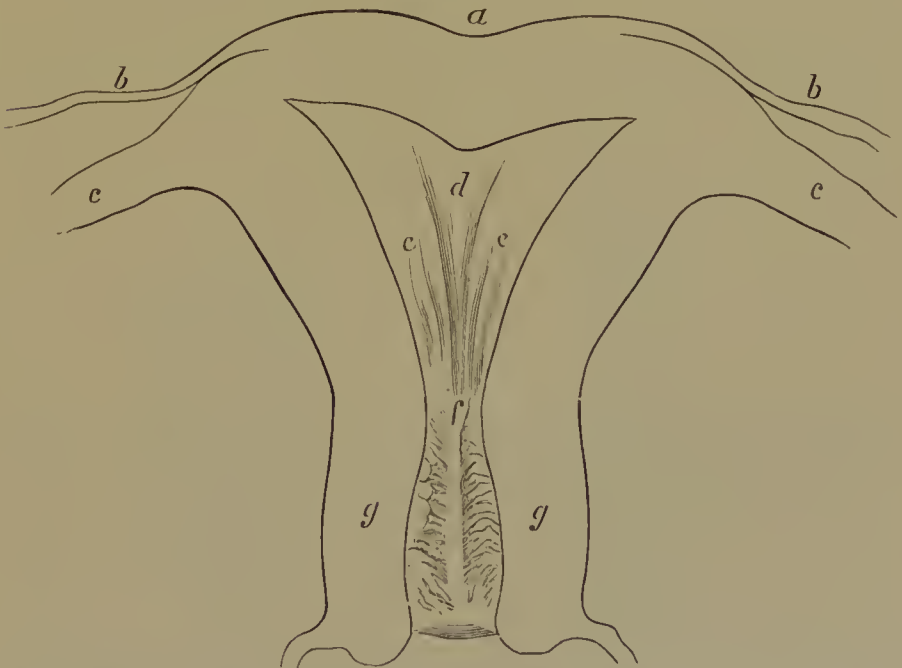
FIG. 88.



Uterus Bicornis Unicollis of a virgin: *a*, vagina; *b*, single neck; *c*, *c* horns; *d*, *d*, tubes; *e*, *e*, ovaries; *f*, *f*, round ligaments. (From Kussmaul.)

VII. UTERUS SUBSEPTUS (*U. semipartitus*, Lefort) is a uterus which looks outside like a single uterus, but is divided internally by an incom-

FIG. 89.



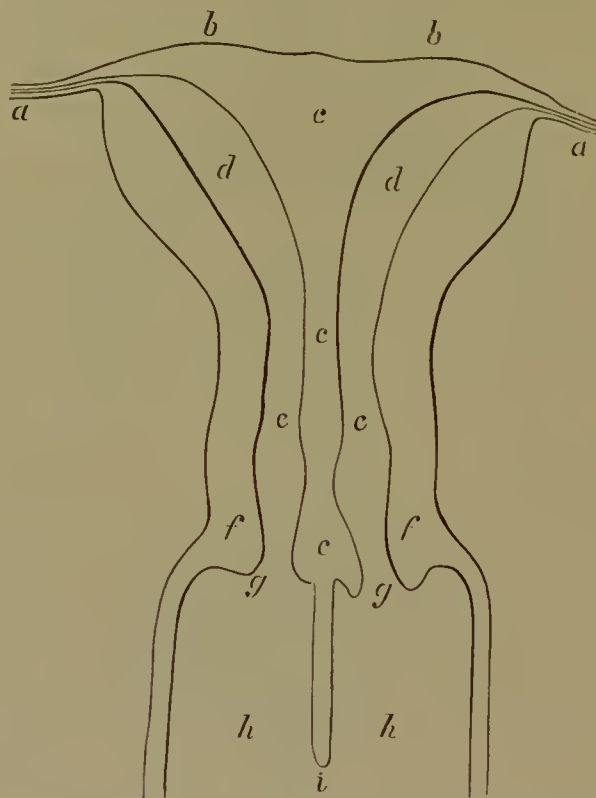
Uterus Arcuatus: *a*, indented fundus; *b*, *b*, tubes; *c*, *c*, round ligaments; *d*, central longitudinal ridge on the posterior wall of the cavity of the body; *e*, *e*, lateral ridges of the same; *f*, internal os; *g*, *g*, neck of the womb. (From Kussmaul.)

plete longitudinal partition (Fig. 91). If the partition extends down through the body and part of the cervix, so as to leave only one open-

ing at the os externum, the variety is called *uterus subseptus uniforis*. If it stops at the os internum, we have the variety called *uterus subseptus unicollis*. If it extends only partially down from the fundus through the body, that variety is called *uterus subseptus unicorporeus*. On the other hand, the septum may only be found near the os externum, thus forming a *uterus biforis supra simplex*.

A peculiar variety standing very near the last one is that observed by "a Western physician," and reported to the New York Obstetrical

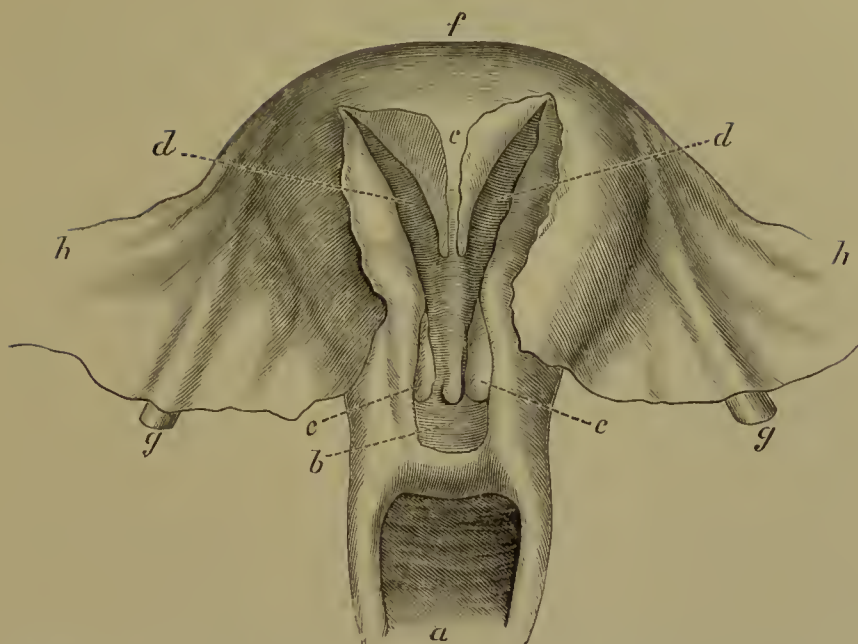
FIG. 90.



Uterus Septus Duplex (natural size), completely double uterus and incompletely double vagina of a girl twenty-two years old: *a, a*, tubes; *b, b*, fundus of the double uterus; *c, c, c*, partition of uterus; *d, d*, cavities of the uterine bodies; *e, e*, internal orifices; *f, f*, external walls of the two necks; *g, g*, external orifices; *h, h*, vaginal canals; *i*, partition which divided the upper third of the vagina into two halves. (From Kussmaul.)

Society by Dr. P. F. Mundé. The patient was a woman of middle age who had been married ten years. She was treated for leucorrhœa, and a discrepancy between her statement about the continuance of the discharge and the doctor's own observation that the cervix got well under appropriate treatment, led to the discovery of a second and narrower vagina leading to another cervix. By means of two sounds the doctor convinced himself that the septum in the vagina was complete, and that it extended somewhat into the cervix, while there was no trace

FIG. 91.



Uterus Septus Uniforis: *a*, vagina; *b*, single os uteri; *c*, partition of uterus, thick above, thin below; *d, d*, right and left uterine cavities; *e, e*, two ridges on the posterior wall of the cervix. (From Kussmaul, after Gravel.)

of a septum in the body of the uterus (Figs. 92 and 93). This form differs from the uterus subseptus biforis by the presence of two vaginal

FIG. 92.



FIG. 92.—*a*, left vaginal entrance; *b*, right vaginal entrance.

FIG. 93.

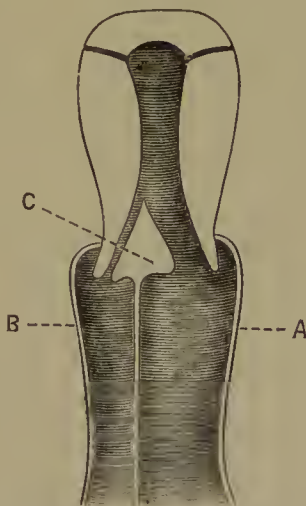


FIG. 93.—Ideal Section, showing double vagina and neck, single body: *A*, left vagina; *B*, right vagina; *C*, partition dividing the neck of the womb.

portions. As the woman had borne^v a child by a premature birth at the sixth month, there may possibly have been a complete septum which

was destroyed during labor. In M. Duncan's case of uterus subseptus the cervix was single, and the "firm septum of the uterine cavity ended at its upper part in a smooth, broad-edged end." Thus there must have been a free space between the septum and the fundus; and since its end was smooth and broad, that means, probably, that it had not been torn during the preceding delivery.

In all forms of double uterus, be it horned or not, the vagina may be single or double. If there is a double vagina, there commonly is a *vaginal portion* in each half. Exceptionally, there is only one prominence, divided internally by a septum. Sometimes there is one cervical portion opening with two openings into one-half of the vagina, the other half ending blind superiorly; which cannot be explained as a simple arrest of development, but constitutes an irregularity. In a case described by Cruveilhier there was a single vagina with a single vaginal portion.

In women with double uterus the menstrual flow comes sometimes from both halves of the uterus, sometimes from one only; and if it comes from both, it may come at different times from the two halves (Kussmaul). In the case of the "Western physician" mentioned above a specular examination performed during menstruation showed that the discharge came from both orifices of the uterus at the same time. Dr. T. A. Emmet¹ has reported a case of double uterus and double vagina, with imperforate hymen on one side, in which there never was a show at less than two months' interval. The doctor, therefore, thought it likely that the patient menstruated from the two uteri alternately. Dr. H. F. Walker has described² the case of a woman with uterus septus, double vagina, and double vaginal portion. In this case menstruation recurred every two weeks. It is therefore possible, although not proven, that both halves had a monthly period, but at different times. Dr. John Aikman's case is conclusive, since it afforded the opportunity of a post-mortem examination. The patient died at the end of menstruation. She had a double uterus and vagina. The mucous membrane of the left cavity was covered with a grayish shreddy structure and opaque mucus, but the membrane itself was firmly adherent and in no part absent. That of the right was quite unaltered. In the left ovary was found a dark-colored granular clot, which had evidently been a Graafian "vesicle;" that is to say, it was a ruptured Graafian follicle filled with a blood-clot. In this case, then, evidently only one half of the uterus was implicated in the menstrual process.

Pregnancy occurs in a double uterus as easily as in a single. One or both halves may become the seat of development of a fœtus. Even if the pregnancy is limited to one side, as a rule the other side participates more or less in the development during gestation, increasing in

¹ *Trans. Am. Gyn. Soc.*, vol. ii. p. 444.

² *Am. Journ. Obstetrics*, vol. viii. p. 515.

size, producing new muscular tissue, and forming a decidua. In some cases the os opens on both sides during labor, in others not. The following case came under my personal observation: C. Y——, æt. 20, primipara. The first menstruation occurred when she was thirteen years old. She had a complete septum of the vagina extending in the median line from the vulva up to the uterus. The two halves of the vagina were of the same size, and led each to a vaginal portion. She was delivered at term of a male child weighing six pounds eight ounces. The child presented by the breech in the left os. In the beginning of labor both mouths dilated, that of the empty right side even more than the other, but later in labor the right stayed at a dilatation of an inch in diameter, while the left became fully dilated. The labor lasted seventeen hours and three-quarters, fifteen of which came on the first stage, two and a quarter on the second, and half an hour on the third. The scrotum having become discolored, the child was easily extracted manually. During parturition the vaginal septum was torn up to a quarter of an inch from the uterus, and ten days after confinement nothing could be felt of it. The interior of the womb was not examined; the external configuration was that of a normal single uterus.

The much-vexed question of *superfœtation* lies beyond the scope of this work. Suffice it here to say that the presence of a double uterus would materially facilitate such an occurrence, for the idea prevailing until quite recently, that ovulation ceased during pregnancy, has been proved to be erroneous, and the conditions of the unimpregnated side of the uterus are such that even after the third month, at which period superfœtation is absolutely impossible in a single uterus on account of the development of the ovum, such an event might occur in it.

It has been noticed in several instances that women with a double uterus were uncommonly broad of face and body, showing a similar disposition to lateral extension in the rest of the body as in the uterus.

VIII. ATRESIA UTERI.—In very rare cases the uterus has been found closed at its lower end. The occlusion may be seated at the os, and be due to the mucous membrane of the vagina, which covers the vaginal portion totally, without leaving any hole open. In other instances the occlusion is found in the cervix itself, which may be totally impermeable, a muscular tissue identical with that of the surrounding parts being found where normally the canal is situated. In the latter case the vaginal portion is small or absent. Atresia has been found in a two-horned uterus.

Menstruation and conception are of course impossible. By being pent up the menstrual flow gives rise to a distension of the womb

formed of blood (*hematometra*¹), which may be changed to pus (*pyometra*²), or instead of blood a mucous fluid may collect (*hydrometra*³). If the atresia affects a two-horned uterus, one or both horns may be occluded, and consequently the fluid collect in both sides or only in one.

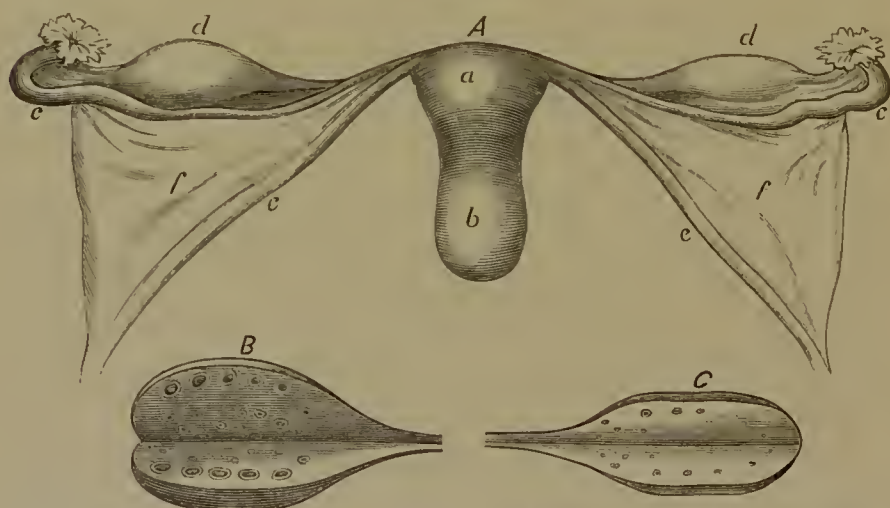
The explanation of the occurrence of congenital atresia of the cervix as a malformation presents no difficulty when we remember that the uterus is formed by the fusion of the Müllerian ducts, and that these at their first appearance are solid.

C. ARREST OF DEVELOPMENT DURING SECOND HALF OF INTRA-UTERINE LIFE, OR AFTER BIRTH.

All the forms of arrested development hitherto considered are referable to the first half of gestation. An arrest at a later period gives rise to less marked variations from the normal type. To this group belong the foetal, the infantile, and the pubescent uterus.

I. UTERUS FŒTALIS AND UTERUS INFANTILIS.—Several observations at post-mortem examinations of adult women have revealed the pres-

FIG. 94.



Infantile Uterus of a girl twenty-one years old: A, Uterus and Appendages diminished: a, body; b, neck; c, c, tubes; d, d, ovaries; e, e, round ligaments; f, f, broad ligaments. B, right ovary cut open longitudinally, showing large Graafian follicles. C, left ovary with smaller follicles. (From Kussmaul.)

ence of a uterus which not only in size, but in configuration, corresponded to that normally found in the foetus toward the end of pregnancy or in young children (Figs. 94, 95). Sometimes it measured only an inch or an inch and a half in length. In other cases it attained the length

¹ αἷμα, blood; μήτρα, womb.

³ ὕδωρ, water; μήτρα, womb.

² πύον, pus; μήτρα, womb.

of a virgin uterus, but characteristic were the preponderance of the neck over the body and the thinness of the walls. Internally the folds of the arbor vitæ were either confined to the cervix or extended more or less up into the body of the womb (Fig. 95). Women with such a uterus rarely menstruate, and cannot conceive, although they may have sexual appetite and be well fit for copulation.

The *uterus foetalis* may at the same time be *bicornis* as the result of a double arrest of development.

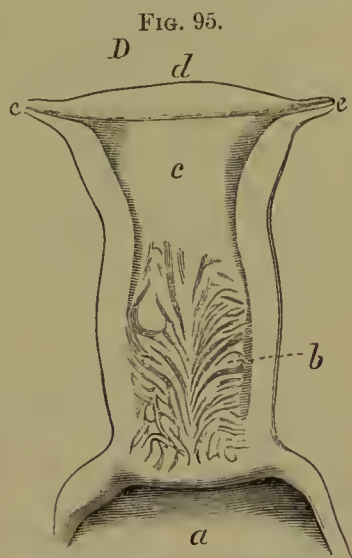
The following case of infantile uterus has come under my personal observation. It concerned a woman thirty-six years of age who had been married six years and never been pregnant. Her courses had begun when she was twenty years old, and had been painful and very scant. She had never felt any sexual appetite, although coition did not cause pain, except when performed shortly after menstruation. Before marriage she was chlorotic and had much leucorrhœa. Vaginal examination revealed a somewhat smaller and rounder os than normal. The cervix was thin, but about of normal length, whereas the body was only represented by a small swelling like a little finger which could be felt both in front and behind. The depth of the whole uterine cavity from os to fundus measured only 4 centimeters ($1\frac{5}{8}$ inches), leaving about 1 centimeter for the cavity of the body.

II. UTERUS PUBESCENS.—Puech gave this name to a class of uteri which are conformed like that of the young girl immediately before puberty, and especially characterized by their small weight, which does not exceed an ounce, whereas the normal uterus averages an ounce and a half. The cervix and the body have about the same length.¹ Menstruation is absent or scanty and irregular, and women with so small a uterus are commonly sterile. Still, a late development may take place, and they may bear children.

III. UTERUS INCUDIFORMIS,² S. BLANGULARIS.—The anvil-shaped

¹ Even in the adult nulliparous woman the cavity of the neck is, according to Sappey (vol. iii. p. 664), longer than that of the body, the dimensions being, on an average, in nulliparous women, the whole cavity, 52 millimeters; the neck, 25; the isthmus, 5; the body, 22; in multiparous women, the whole cavity, 57 millimeters; the neck, 24; the isthmus, 5; and the body, 28. Others, throwing the isthmus together with the body, come to the opposite conclusion (Kussmaul, p. 18).

² *Incus*, Latin, anvil.



Coronal Section of the same Uterus as in Fig. 94, natural size; a, vagina; b, neck with arbor vitæ; c, body; d, fundus; c, e, internal ends of the tubes.

uterus (Fig. 96) is well developed in other respects, but the deficient bulging of the fundus, which forms almost a straight line from one Fallopian tube to the other, and the abrupt transition from the neck to the body of the womb, give it the shape of an anvil, and reminds us of a uterus from the fourth or fifth month of gestation.

FIG. 96.



Uterus Incudiformis. (From Kussmaul, after Oldham.)

IV. UTERUS PARVICOLLIS AND ACOLLIS.—The body of the uterus may be well shaped, but the neck, or at least the vaginal portion, rudimentary or absent.

In other cases there obtains smallness of the uterus, with specially defective development of the neck.

V. ANTEFLEXION is often congenital, and as long as there is only an even and moderate curvature it may be regarded as a continuation of the shape of the uterus in the fœtus and in young children.

D. IRREGULAR DEVELOPMENT.

The forms so far considered were all reducible to an arrest of development. In others we must admit a true divergence from the normal type.

I. OBLIQUITY.—There may be a congenital crookedness of the womb itself, or an otherwise well-shaped uterus may be misplaced. The former condition is attributable to an uneven development of the two Müllerian ducts, which combined go to form the uterus. Thus a *congenital lateroflexion* is produced. A similar result may be due to fetal peritonitis, with cicatricial shrinkage of the broad ligament on one side.

A well-shaped uterus may be tilted over to one side, especially where there is a beginning ovarian hernia.

II. LATEROPOSITION.—It is not rare to find in the adult the womb well shaped, but placed with its axis parallel to the median line instead of lying in the same. This lateroposition, when it is not due to previous inflammation and cicatricial shrinkage, is referable to an uneven development of the broad ligaments.

III. ANTEPOSITION, AND IV. POSTPOSITION—that is, the placement of an otherwise normal womb too far forward to the symphysis or too far back toward the sacrum—are probably due to similar irregularities in the development of the surrounding parts.

V. HERNIA UTERI.—The uterus has been found in a congenital inguinal hernia. This irregular position is due to a complete descent of the ovary like that which is normal for the genital gland of the other sex. The womb is then pulled along until it enters the hernial sac. In this unwonted place it has even become impregnated, and been subjected to Cæsarean section.

VI. ABNORMAL COMMUNICATIONS.—The uterus has been found forming one sac together with the bladder and the vagina. It has likewise been found communicating with the bladder or the colon ascendens or the rectum. In a case described by Doran the right side of a uterus bipartitus opened on the outer surface of the body.

THE VAGINA.

The vagina being originally one with the uterus, its malformations are in many respects similar. It may be more or less completely closed by a transverse septum ; it may be divided by a longitudinal septum ; it may be too narrow, or it may have faulty communications with other cavities.

ATRESIA VAGINÆ.—The word “atresia” is often used by authors in a loose way in speaking of cases in which the vagina was closed by a septum with a narrow opening. The etymology of the word, from *a* privative, and *τρᾶω*, to bore, teaches that it ought only to be applied to an unbored—that is, absolutely closed—vagina. Where the menstrual flow can find an outlet and spermatozoids an entrance the term atresia is not appropriate, but ought to be replaced by *stenosis*.¹

Sometimes the atresia is only produced by a membrane forming a transverse partition in the vaginal canal. The most common kind of this deformity is that in which the hymen closes the whole entrance (*atresia hymenalis*). It is commonly stated that the hymen is formed about the end of the fifth month of gestation. If that is correct, the atresia hymenalis would be an overgrowth ending in the transformation of the hymenial valve to a complete circle ; but perhaps atresia might be due to a fusion of the originally solid Müllerian ducts at their lower end, and the persistence of this solid membrane without the formation of an opening.

Breisky has found the vagina closed in newborn children by a thin membrane situated just above the hymen (*septum retrohymenale*).

A more solid transverse septum is found in adults about an inch above the entrance of the vagina or nearer the upper end. Sometimes a more extensive atresia has been found in the middle between a normal upper and lower part of the vagina. As many as three or four

¹ Στενός, narrow.

transverse septa have been found placed one above the other and separated by different kinds of retained fluid.

Finally, the whole canal may be absent—a condition which commonly is combined with absence of the uterus; but in other cases a normal uterus is found beyond the closed vagina. A case in which the former condition seemed to obtain has come under my personal observation, and was reported to the New York Obstetrical Society (October 7, 1884). The patient was twenty-one years old and had been married ten months. She had never menstruated, but had had monthly molimina for the last two or three years. She had sexual desire, but had never had any satisfaction. She complained of headache every few days, general weakness, and slight constipation. She was strongly built, had well-developed breasts, an uncommon abundance of black pubic hair blending with a rich growth of hair around the anus. The urethra and the rectum were perfectly normal. So were the large and small labia; but there was no vagina. In its place, just behind the meatus urinarius, close up to the median line, were found two round depressions, one on either side. The left admitted a probe to the distance of one-quarter of an inch; the right one was imperviable. These two recesses were evidently remnants of the Müllerian ducts. Behind them the fossa navicularis yielded easily to pressure, so as to admit a finger to the depth of one and a half inches. This pouch was the place in which coition took place, and had probably been expanded considerably by the act itself. There was no tumor over the symphysis. In spite of a very careful examination with the index in the rectum, a sound in the bladder, and the other hand on the abdomen, no trace of a uterus or ovaries could be felt.

In Gomer Davies's case atresia of the vagina was combined with a cyst formed by distension of its upper part. It was found in a newly-born child, in whom it occupied most of the abdomen. It contained about six ounces of a clear fluid, with grumous deposit at the bottom. The uterus sat at the upper part of the cyst, communicating with it.

Complete atresia excludes menstruation, and may give rise to the accumulation of blood (*hematocolpos*) or pus (*pyocolpos*) in the vagina above the septum or in the uterus. Atresia prevents impregnation, and renders a normal connection difficult or impossible. If there is only a transverse septum in the upper part of the vagina, the relations approach the normal condition. If it is situated near the lower end or at the entrance, the pouch may in course of time become considerably deeper. Sometimes connection takes place in one of the neighboring openings, the urethra or the anus, especially the former. The urethra is in some women very easily dilatable. I examined once an intact virgin in whom the entrance had not been made easy by masturbation, as often is the case, and I was much surprised to find that my index,

although not exercising more than a very moderate pressure, had penetrated into the bladder. Retraeing my steps, I found much more resistance in entering the vagina, although this organ proved to be entirely normal. This is probably a rare condition: I at least have only met with this single case. But by repeated attempts at coition in cases of occlusion of the vagina the urethra becomes often gradually dilated, so as to admit the male member; and, strange enough, this considerable dilatation results only exceptionally in incontinence of urine. As a rule, it does not give rise to any such trouble.

Much more common than complete atresia are the cases of *stenosis* produced by a more or less complete septum with one or more openings. Such an opening is sometimes so small that it can only be discovered at the time of menstruation, when perhaps softening takes place; and, at all events, the blood trickling through the opening leads to its discovery. Even under so unfavorable circumstances spermatazooids may work their way into the interior of the womb and pregnancy take place. The membrane will then, of course, form an obstruction to delivery, and require operative interference, as in the cases of I. E. Taylor, J. S. Coleman, F. Barnes, Heywood Smith, and others.

Different theories have been proposed for explaining the occurrence of a transverse septum in the vagina. One is that after the Müllerian ducts had been perforated, and had been fused together into one canal, an agglutination and coalescence took place between the two walls. According to another, the septum is looked upon as a remnant of the originally solid filaments, which have coalesced, but failed to be tunneled at the seat of the membrane. Finally, where there is only one more or less thick septum, it may be that the canal above the septum belongs to one Müllerian duct, and that below to the other.

DOUBLE VAGINA.—Like the uterus, so the vagina may be divided into two halves by a longitudinal partition. It is composed of two layers of mucous membrane and intervening muscular tissue. It may be complete or incomplete. In the latter case it may be found in the upper part or in the lower or in the middle, or be perforated by one or more holes.

When the vagina is double the uterus is commonly so too, but in rarer cases a double vagina may correspond to a single uterus. One-half of the vagina is often more developed than the other. Where there is a one-horned uterus combined with a double vagina, that side which corresponds to the atrophied or absent uterine horn remains rudimentary. Sometimes there corresponds only one-half of the vagina to a one-horned uterus, the other half being absent altogether. In this case the vagina is very narrow.

When a double vagina corresponds to an entirely double uterus (*bicornis duplex* or *septus*), as a rule there is a separate vaginal portion

in each half of the vagina. As we have seen above, there has exceptionally been found a single cervical portion with two openings in one half of the vagina and none in the other. One-half of the vagina may be too narrow for coition, and the one that is used may end as a cul-de-sac without communication with the womb.

Instead of a more or less complete vaginal septum, there may only be found a band uniting the anterior with the posterior wall in the median line. I have seen such a case myself, in which there was a fleshy band as thick as a finger just below the vaginal portion. As it obstructed labor, I cut it with scissors. There was no bleeding. In another case under my care the husband complained of some obstruction to the introduction of the penis. On examination I found on the left side of the upper half of the vagina a septum one and a half inches high and three-quarters of an inch wide. Between it and the vaginal wall there was a free passage. This septum was likewise cut with scissors, which gave rise to some little hemorrhage. As the lady had borne a large child before, and the dyspareunia had appeared after the birth of the child, it is not unlikely that this septum was only a remnant of a more complete one which had been partially destroyed during parturition.

Double vagina may be combined with atresia on one or both sides, and thus unilateral or bilateral hæmatocolpos or pyocolpos may be produced.

Stenosis, or narrowness of the vagina, may, as we have seen above, be due to the presence of an incomplete transverse septum, or to the vagina being really only half a vagina. By an arrest of development in childhood and later it may likewise stay narrow—a condition which sometimes is combined with the insufficient development of the uterus described above as *uterus foetalis* and *uterus infantilis*.

BLIND CANALS.—Immediately above the entrance to the vagina, on one side of the columna rugarum, are sometimes found openings leading into canals lined with mucous membrane, but with smooth walls extending upward parallel to the vaginal wall or deviating into the perivaginal connective tissue. They may be an inch and a half long and thick enough to admit the little finger. The upper end is closed. These canals are supposed to be uncommonly-developed lacunæ of the mucous membrane. They differ from a secondary vagina by their thin and smooth wall, and sometimes by their direction (Breisky).

FAULTY COMMUNICATIONS.—When we remember that at an early stage of foetal development there is a common cloaca in which end the urinary and genital canals, as well as the rectum (see Fig. 2, p. 69; Figs. 31 and 32, p. 89), it is easy to understand how by an arrest of development faulty communications may be found between the different passages.

Normally, the rectum is separated from the sinus urogenitalis by the formation of a septum which is completed in the tenth week. If this is not formed, the rectum will apparently open into the vagina, and there will be atresia ani—a condition which has been designated by the strange name of *atresia ani-vaginalis*. What has been taken for the vagina is really the cloaca, which has not been divided into a rectal and a urogenital part (persistent cloaca, Fig. 97). Sometimes the opening of the rectum has a sphincter, so that the individual may retain the feces voluntarily. This apparent communication with the vagina is not very rare. Dr. J. H. Pooley of this city has compiled 38 cases.

In other cases it is the genital canal which seems to open into the normally-formed rectum. The celebrated French surgeon Louis has reported the case of a girl whose genitals were imperforate. She menstruated through the anus, and through the same opening coition took place, and, finally, a child at full term was born that way. In this case either the vagina or the uterus must have opened into the rectum. It is not stated where the urethra opened, but there can scarcely be any doubt that that organ likewise opened inside of the only opening present.

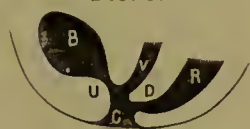
A similar faulty communication may take place between the vagina and the bladder or the urethra. At first the sinus urogenitalis appears as a continuation of the bladder, but in consequence of the growth of the uterus and the vagina in the sixth month, and the comparatively slow development of the sinus urogenitalis, it appears finally as the continuation of the vagina, forming the vestibule into which the urethra opens (Fig. 33, p. 90). Some cases present an appearance as if the urethra did not open into the vulva, but into the vagina itself. A closer examination will, however, reveal that this condition is due to an uncommon depth and narrowness of the sinus urogenitalis, so that what appears to be the vagina is really the vestibule (persistent sinus urogenitalis; Fig. 98).

In Palfyn's case there was one sae, into which opened a uterus didelphys and the intestine.

In cases of extroversion of the bladder the vagina, as well as the ileum and the colon, have been found to open on the exposed mucous membrane. In Lebedeff's case there was a congenital vesico-vaginal fistula combined with hypospadias.

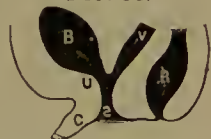
W. H. Baker of Boston has described and successfully operated on a case in which the left ureter opened into the vagina, instead of being connected with the bladder.

FIG. 97.



Persistent Cloaca: C, cloaca; D, partition which ought to have formed the perineum; R, rectum; V, vagina; B, bladder; U, urethra. (From Schroeder.)

FIG. 98.

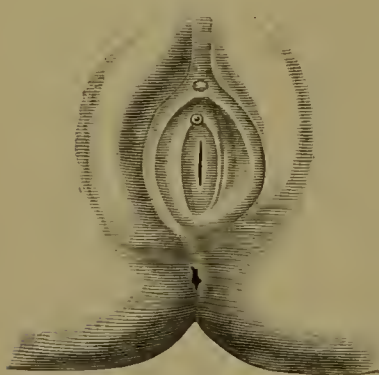


Persistent Sinus Urogenitalis: C, hyper-trophic clitoris; B, bladder; U, urethra; V, vagina; S, sinus urogenitalis; R, rectum. (From Schroeder.)

THE HYMEN.

The hymen is not, as stated in most anatomical textbooks, a semilunar fold of the mucous membrane placed at the entrance of the vagina. It is now, as stated above, looked upon as being the whole lower end of the vagina, and its shape varies very much. As a full knowledge of the normal shape of the hymen is of great practical value in legal questions, we will give some details on this subject. Tardieu, who has examined more than 600 cases with special reference to the hymen, admits five normal conformations, which he places in the

FIG. 99.



following order of decreasing frequency :

1. The hymen consists of a strip of tissue bent at the lower end so as to form two lateral lips, touching one another in a vertical line ; which shape is almost constantly found in childhood, and sometimes yet after puberty (Fig. 99, from Tardieu).
 2. The hymen forms an irregularly circular diaphragm with a more or less large opening in the anterior third (*hymen annularis*).¹
 3. The diaphragm is exactly circular, with a central circular opening (*hymen circularis*).
 4. The diaphragm is crescent-shaped, with a concave border turned forward, and two horns ending on the inside of the labia minora (*hymen semilunaris*).²
 5. The hymen is only represented by a low circular or semilunar ridge.
- Besides these normal shapes the hymen presents several abnormalities. According to Dohrn, an intact hymen may present indentations. In the *hymen denticulatus* the edge does not form one smooth line, but is divided into many prominences by short nicks. It is distinguished from a ruptured hymen by the softness of the edge, the round contour of the prominences and recesses, and the absence of cicatricial tissue. The *hymen fimbriatus* has the edge split into a fine fringe, due to papillary hypertrophy, but similar growths are then found on the surfaces of the hymen, on the labia minora, and round the urethra.

It is doubtful if the hymen is ever absent. At least Tardieu has never seen a case in which there were not distinct remnants of it, but the last-mentioned shape, where the hymen is reduced to a scarcely prominent ring, can easily be mistaken for total absence.

ATRESIA HYMENALIS.—The hymen may form a completely closed septum. This condition, like that of the presence of a diaphragm higher up in the vagina, will cause retention of the menstrual flow as a tarry mass (*hæmatocolpos*), or the accumulated fluid may suppurate (*pyocolpos*).

¹ *Annulus*, ring.

² *Semi*, half; *luna*, moon.

ABNORMAL OPENINGS.—In other cases the hymen has two round or lengthy openings (*hymen biforis*¹ or *bifenestratus*).² If the openings are large and the intervening tissue narrow, the case is called *hymen septus*. Sometimes the partition grows out from the anterior and posterior circumference, but without joining in the middle (*hymen subseptus*).

The hymen may likewise be perforated by many small openings (*hymen cribriformis*).³

FLESHY HYMEN.—The normal hymen consists of a double layer of mucous membrane with an intermediate layer of muscular fibres and many blood-vessels. In abnormal cases this intermediate layer may become so much developed as to present a serious obstacle to connection.

DOUBLE HYMEN.—The hymen may be said to be double in different senses. Sometimes it is composed of two diaphragms placed one above the other, but the upper one in such cases is probably a transverse septum near the lower end of the vagina. Sometimes this condition is due to accumulation of mucus above the hymen, producing a dilatation of the lower end of the vagina, limited above by a constriction, at the seat of which the second hymen is developed.

Where the vagina is double there is generally a hymen in each half, but often the lower part of one-half of the vagina may be absent, so that the canal ends blind without any hymen. Such a condition will give rise to the formation of a lateral collection of blood or other fluid.

Finally, the hymen alone, in an otherwise single vagina, may be separated in two by a septum running in an antero-posterior direction. (See *Hymen septus*.)

CONGENITAL CYSTS.—Barstellberger has described a cyst of the size of a lentil in the hymen of a newborn girl. Microscopical examination showed that it had been formed by invagination from the epithelium on the vulvar side of the organ.

THE HYMEN IN THE NEGRO RACE.—Is there any difference between the white and the black woman as to the place of the hymen? Dr. E. B. Turnipseed of Columbia, S. C., asserted some years ago that the hymen in the negress was situated from one and a half to two inches "above the entrance of the vagina." He gave the details of nine cases, seven of which were in children eight to twelve years old, in whom the distance was from a half to three-quarters of an inch above the entrance. This assertion was corroborated by Dr. C. H. Fort of Adams Station, Tennessee. He gives six cases. It is claimed that the hymen in these cases was situated one or two inches "within the vulva." The latter author claims likewise that the hymen of the

¹ *Bis*, twice; *foris*, door.

² *Fenestra*, window.

³ *Cribrum*, sieve.

negress is of greater density than that of the white woman. He thinks that these two features, the high position and the unusual density, "would enable any practised physician to distinguish the negro from the white race, even in the dark, by aid of touch alone." On the other hand, Dr. H. O. Hyatt of Kinston, N. C., claimed to have examined a thousand negro women without remarking any difference between the two races in regard to the vagina and hymen. He thinks the assertion of Dr. Turnipseed is based on a confusion of the rectilinear rima pudendi and the round orificium vaginae. I have no personal experience on this question to offer. Dr. Hyatt is right, that the lower and upper openings of the vulva are very often confounded, as I have pointed out myself in the anatomical remarks forming the introduction to my paper on the "Obstetric Treatment of the Perineum;" but even if the two above-named observers should have made this mistake, that could not account for much more than one inch, and by no means for the distance of two inches which they claim in some cases. Besides, it is not likely that they would claim as a peculiarity for the negro race what they could scarcely be otherwise than familiar with in the white race. If their observation is correct, the explanation can only be that the sinus urogenitalis is deeper in the black race. It would be very desirable that Southern practitioners, who have a larger field of observation in this regard than we who live in the North, warned as to the possible mistake pointed out, would pay attention to this interesting anthropological question, and give us a large number of exact observations of the seat of the hymen in the negro woman.

As to the theory of the malformations of the hymen, it must be remembered from the section on Development (p. 92) that this organ is formed late in foetal life, beginning in the nineteenth week, at a time when the Müllerian ducts long ago have opened into the sinus urogenitalis and been fused together into one canal. The atresia of the hymen can therefore not be explained as an arrest of development, like that which obtains when the same condition is found higher up in the vagina or in the uterus, but it must be looked upon as an excess of growth. Nor can the double hymen simply be taken as an arrest of development of the hymen itself, but must be regarded as an arrest of development of the lower end of the Müllerian ducts, by which there stays two openings, and the subsequent development of a hymen in each of them. Multiplicity of openings must be looked upon as the result of an irregular growth.

THE VULVA.

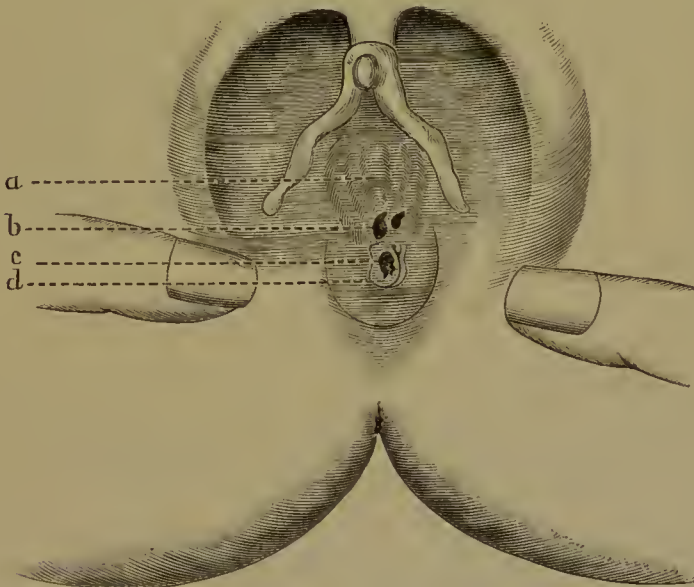
ABSENCE OF VULVA.—The whole of the external genitals, together with the anus, may be absent, a continuation of the skin without any

openings occupying their place. This condition is due to an arrest of development at the very earliest period of fetal development, before the appearance of the cloacal opening in the fourth week. It is almost always combined with an arrest of development in other organs, and is only found in non-viable fetuses.

In other cases there is an anus, but the vulva has not been formed, the genital furrow having not become deep enough to open into the sinus urogenitalis.

HYPOSPADIAS.¹—When the posterior wall of the urethra is defective the condition is called hypospadias (Fig. 100). If the defect extends far up, the control over the bladder is lost.

FIG. 100.



Hypospadias: *a*, open canal, formed by the anterior wall of the urethra, the posterior being absent in this part; *b*, posterior, closed part of the urethra; *d*, hymen; *c*, opening in the same. (From Winckel, after Mosengeil.)

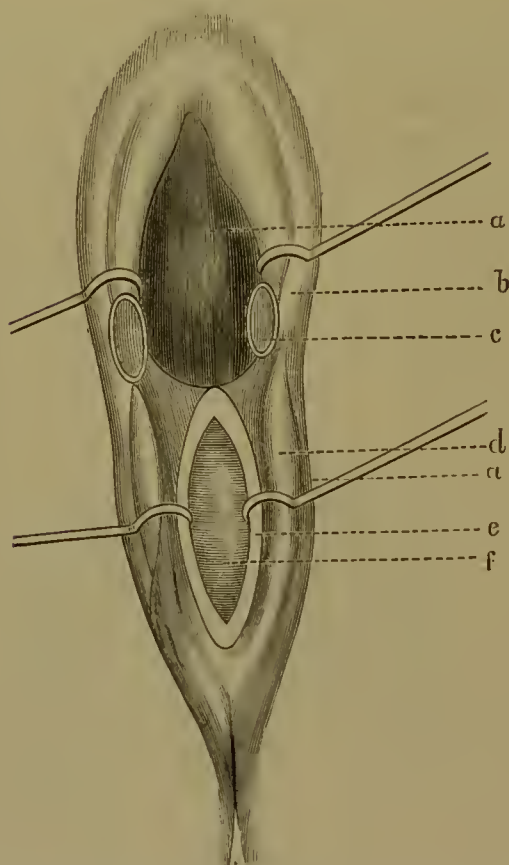
EPISPADIAS² is the name for a condition in which there is a cleft in the anterior wall of the urethra, which mostly is combined with a cleft in the anterior wall of the bladder (*extroversio vesicæ*). In the upper part of the vulva, just below the symphysis pubis, appears the mucous membrane of the open bladder (Fig. 101). There is no urethra. The clitoris may be cleft.

The urethra forms originally one organ with the bladder. Both are a development of that part of the allantois which is situated inside of the fetus. Thus this cleavage is not a simple arrest of development, but is attributable to a deficiency of the anterior wall of the bladder, as well as to an arrest of development in the abdominal wall.

¹ Ὑπόδ, under; σπαδίζω, I tear.

² Ἐπί, on; σπαδίζω, I tear.

FIG. 101.



Epispadias: *a*, fissure in the bladder; *b*, labium majus; *c*, clitoris; *d*, labium minus; *e*, hymen; *f*, vaginal entrance. (From Winckel, after Kleinwächter.)

The clitoris has been found cleft, without any cleavage of the urethra or bladder, but combined with a cleft symphysis and a deficiency in the abdominal wall above the bladder.

OTHER CONGENITAL ABNORMALITIES.

The *clitoris* may be absent, rudimentary, or, on the other hand, very much enlarged. Hyrtl states that in some African tribes the clitoris hangs down, covering the rima pudendi as a valve, and that the people fasten it with a ring to the perineum as a protection for virginity. In hermaphrodites it often becomes as large as a penis of moderate dimensions. Bainbridge found in a woman whom he assisted in labor a clitoris about five inches long and of the diameter of a quiescent penis of an adult, to which organ it became still more like by the presence of a groove behind the glans. At a later examination it was found measuring three inches in length and two in circumference.

The *labia minora* may likewise be absent on one or both sides.

There may be found four, or even six, due to a folding of the edges of the genital furrow. Sometimes the labia minora are much longer than usual, which peculiarity is found constantly in Hottentot women and has been called the *Hottentot apron*. These flaps are said to obtain a length of eight or twelve inches. In some tribes they are regularly cut away by a kind of circumcision.

The *labia majora* are more rarely the seat of a similar congenital hypertrophy.

Atresia vulvæ superficialis.—The labia majora as well as the labia minora may in the second half of foetal life become agglutinated, and coalesce more or less extensively from behind forward, so as to give the appearance of an uncommonly long perineum. It is rare that the nymphæ are grown together to such an extent as to prevent urination in the newborn child. Menstruation is unimpeded, but the dimensions of the entrance may be so small as to oppose a serious obstacle to sexual connection unless it be removed early in life.

Vulva infantilis.—By an arrest of development after the birth of the child the vulva may retain in the adult the small dimensions of childhood. If, nevertheless, impregnation takes place, the condition may give rise to difficulties in childbirth.

HERMAPHRODISM.¹

Considerable practical no less than scientific interest attaches to that group of malformations which are designated by the term “hermaphrodisism” or “hermaphroditism;” that is, the condition in which the characteristics of the two sexes become more or less blended in one individual.

The physician may have to decide at the birth of a child to what sex it belongs—a decision which, if hastily made, may lead to the gravest consequences and cause much unnecessary suffering, and which often cannot be made at all without an examination of the inner parts, as in Sippel and Chalmers’s cases, where the child to all appearances was simply a male hypospadiæus, while the autopsy revealed a perfect uterus, ovaries, tubes, broad and round ligaments. If there is any doubt about the sex of a child, I think Lawson Tait’s advice is a good one—to bring the child up as a male. When it grows up it will find out that it is not formed like other boys, and when grown to manhood, if unfit to perform the functions of the male, it will abstain from marriage. Girls are often in an astounding degree ignorant of everything

¹ Hermaphroditus, a son of Hermes (or Mercury) and Aphrodite (or Venus), according to Grecian mythology, became the object of the amorous desires of the nymph Salmaeis, who induced the gods to make them one body, retaining the characteristics of both sexes.

belonging to sexual relations. An hermaphrodite brought up as a girl may, therefore, marry without having any idea of being unfit for sexual connection, or the male instincts may awake, and the male hermaphrodite, being brought up among girls, and placed in positions where the instincts can be satisfied, much mischief may be done, as in the case of Madelaine Mugnoz, the nun of Ubeda, who suffered death for rape. It is so much wiser to follow this advice as the possibility of erring by so doing is much smaller, male hermaphrodites being much more common than female.

Important medico-legal questions attach to the question of hermaphroditism. Often males only inherit certain estates, and it may become necessary to decide if the heir-apparent fulfils the necessary requirement as to sex. In the United States the right of voting as a citizen and of filling certain offices is restricted to the male sex, and consequently a man's right to do so may be challenged on account of doubtful sex. Hermaphroditism may be claimed as entitling to divorce, or the question may come up whether a child can be the offspring of an hermaphrodite or not.

Klebs's division of the different kinds of hermaphroditism recommends itself by its clearness, completeness, and practical value, and is therefore a valuable guide which we will follow.¹ This author distinguishes first *true* from *spurious* hermaphroditism. As true hermaphroditism only such cases are recognized in which a testicle and an ovary are found in the same individual. Under the term spurious hermaphroditism he unites all those cases in which the genital glands belong to one sex and the external organs and internal ducts approach more or less the type of the other sex.

From the history of development we know that the genitals are composed of three different parts: first, the sexual glands; second, the two sets of ducts (the Wolffian ducts, which are transformed to the tail of the epididymis and the vas deferens; and the Müllerian ducts, which form the Fallopian tubes, the uterus, and the vagina); and third, the external genitals. These three portions having each its own independent foundation, we can understand how one of them may become developed according to a different type from the others.

TRUE HERMAPHRODISM, OR ANDROGYNIA (*Hermaphroditismus verus*).—This group comprises only the cases in which a testicle and an ovary are found in the same individual. This condition is normal

¹The commonly-followed system distinguishes between *spurious* and *true* hermaphroditism. In the first class are only placed slight cases, such as hypospadias, enlarged clitoris, atresia of the vulva, etc., which we exclude all together. The second comprises three groups: 1, *Lateral hermaphroditism*, where there is a testicle on one side, an ovary on the other; 2, *vertical or double hermaphroditism*, where on the same side are found male and female organs; 3, *transverse hermaphroditism*, where the internal organs are male, the external female.

in many lower animals, and is occasionally found in the highest. Its existence in man is yet denied by many, and most of the older cases are not reliable. Only those can count in which a microscopical examination yields a positive result. It has been claimed that both testicles and both ovaries have been found in one individual (*true bilateral hermaphrodisism*); and I think Heppner's case is one in point. In the body of a child that died at the age of two months he found (*a*) an organ which with the same right can be called a hypospadiac penis and a hypertrophied clitoris; (*b*) a cleft scrotum; (*c*) a sinus urogenitalis and Rosenmüller's organ representing parovarium and epididymis; furthermore, a prostate and both testicles; and, finally, a vagina, uterus, tubes, both ovaries, round and broad ligaments. The microscopical examination showed the ovary to be full of Graafian follicles, some of which contained an ovum, while the testicle was composed of seminal canals. It seems that this most important case has been overlooked by Klebs, since he does not even allude to it.

It has likewise been asserted that on one side there may be one sexual gland, either a testicle or an ovary, and on the other both a testicle and an ovary (*true unilateral hermaphrodisism*); but no authentic case is known of this kind. Klebs thinks that perhaps Bannon's case belongs to this group, but it appears from his abstract that he has not seen the original, since he is entirely misinformed in regard to many important points. The individual died at the age of twenty-six years, and was supposed to be a man. The external genitals were of an undecided character. There was a hymen, a vagina, and a uterus, from the left upper angle of which started a Fallopian tube, but it went between the uterus and rectum over to the right side to a body which is called an ovary. On the same side was found a testicle with epididymis, from which a long tube, which Bannon takes to be a vas deferens, went to the right upper angle of the uterus and communicated with its cavity. I therefore take it rather to be an elongated Fallopian tube. Behind and partly in the internal inguinal ring was found "a glandular organ." No description is given of the latter, nor does it seem to have been examined microscopically. The supposed ovary was submitted to such an examination, and a drawing is given of its appearance; but no description except the words "the granules visible are not Graafian follicles, but appeared to be fat-globules;" and the drawing has not the slightest resemblance to the structure of an ovary. The testicle had an albuginea and the tubular arrangement proper to that organ. The fluid contained in the commencement of the vas deferens and epididymis had the peculiar odor and consistence of the human semen. Under the microscope it showed numerous cells containing granules, but no trace of spermatozooids. It is clear that it was only, so to say, accidental that the left genital gland

was found on the right side, and no genital character is claimed for the "glandular organ" at the entrance of the inguinal canal; and while it must be admitted that the individual had a testis, it is not proved, and not even made likely, that he had an ovary. But if Heppner's case is admitted as one of true bilateral hermaphroditism, we may of course as well expect once to find a similar case with a double sexual gland on one side and a single on the other.

It is difficult yet not impossible to understand how the same individual can have more than one set of reproductive glands, for we have seen (p. 76) that it is one and the same body, which, identical in the beginning, later turns out to be either a testicle or an ovary. The connective tissue that goes to form the ovary or the testicle is indeed identically the same substance; but perhaps the epithelial part of the two glands has a different origin. Waldeyer thinks, namely, that the seminal canals are formed as invaginations from the Wolffian duct, while the follicles in the ovaries are derived from the germ-epithelium.

We have furthermore seen (p. 92) that supernumerary ovaries may be found, and that not only by a division of one larger body, but as a separate body of the size of a normal testicle. As to testicles, there is only one case on record of three testicles being found in the same individual at an autopsy, and even this case is not beyond dispute. The other cases regard living men, and are consequently still less convincing (Foerster). If thus we can have more than two glands of the same sex, the possibility of one or more of them having the type characteristic of the other sex is given.

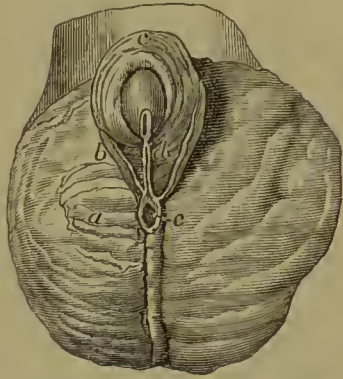
It must be admitted that at the very earliest point of development every human individual is, in a certain sense, hermaphroditic, inasmuch as there is a common foundation for the urogenital system, which very soon separates into two parts, the germ-epithelium and the epithelium of the Wolffian duct, the first of which is developed to the female sexual glands and ducts, while the second forms the male ducts, the uropoëtic system, and probably the male glands. Even in female individuals the beginning of seminal canals are found in the parovarium, and, on the other hand, sometimes some large cells are found in the surface epithelium of the testicle which are supposed to be primordial ova.

The third possibility of true hermaphroditism is the presence of a testicle on one side and an ovary on the other (*true lateral hermaphroditism*). From what we have just said about the identity of the two glands, it is not unlikely that one might be developed according to the male and the other to the female type.

The most important case of supposed true lateral hermaphroditism is a specimen found in the pathological museum at Zürich. It comes

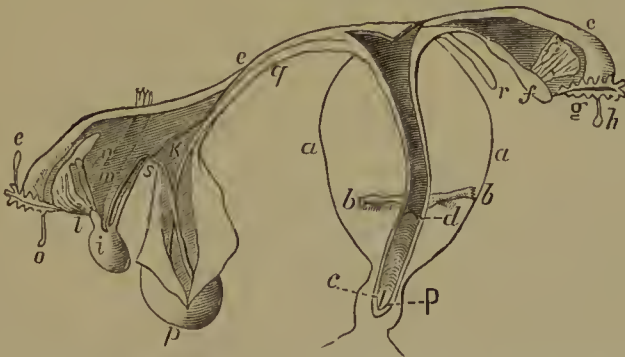
from a newborn child, and was first described by H. Meyer, and later examined microscopically and described by Klebs. (For details we must refer the reader to the work of the latter, *loc. cit.*, p. 728; here we must limit ourselves to the most important features of the case.) The child had a short penis with a large glans and a bulky prepuce (Fig. 102). On the end of the glans is a blind urethra. Below, the prepuce is continued in a fissure, the posterior part of which leads into the sinus urogenitalis. Behind this opening is a raphé uniting the two halves of a well-developed serotum, in the left half of which is found a testicle. From the sides of the genital fissure, near the entrance to the sinus urogenitalis, start two low ridges of skin which run backward and outward to the root of the penis. On the posterior wall of the sinus urogenitalis is found a colliculus seminalis with several fine apertures, none of which lead to a vas deferens, but one, on the left side, leads into a vagina and uterus areuatus (Fig. 103). A slight swelling round the genital canal at the seat of the colliculus seminalis shows the microscopical structure of the prostate. From the right horn of the

FIG. 102.



External Genitals in a case of hermaphroditismus lateralis: *a*, serotum; *b*, labia majora; *c*, prepuce; *d*, labia minora; *e*, entrance to sinus urogenitalis. (From Klebs.)

FIG. 103.



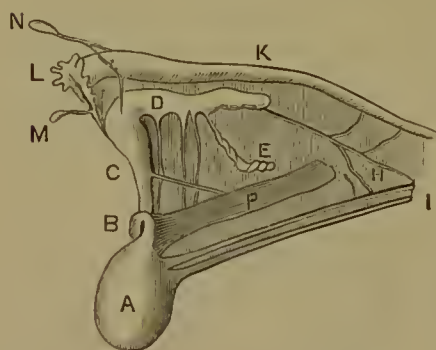
Internal Genitals of the same case of lateral hermaphroditism, seen from behind: *a*, bladder; *b, b*, ureters; *c*, vaginal entrance; *c, d*, vagina; *d*, external os; *e, e*, Fallopian tubes; *f*, ovary; *g*, parovarium; *h*, right Morgagni's hydatid; *i*, testicle; *k*, ovarian (or testicular) ligament; *l*, epididymis; *m*, bundle of vessels and nerves of the cord; *n*, vasa deferentia; *o, o*, hydatids of left tube; *p*, peritoneal pouch in left half of serotum, containing *q*, left round ligament, and *s*, gubernaculum Hunteri; *r*, right round ligament; *P*, prostate. (From Klebs.)

uterus start the round ligament, the ovarian ligament leading to a club-shaped body supposed to be an ovary, and finally the Fallopian tube. Between the ovary and the tube is found a parovarium. The microscopical examination of the supposed ovary shows total *absence of fol-*

licles, with which the normal ovaries of newborn children are crowded. The stroma is composed of a dense fibrous tissue with many nuclei, as in the rete vasculosum testis, and tunnelled by numerous branching and anastomosing canals from 8 to 20 micromillimeters¹ in width. They have no proper wall, but the surrounding tissue forms a fine double contour. Their interior is filled with small polygonal cells measuring from 3 to 5 micromillimeters in diameter, and showing a nucleus and a granular protoplasm. Besides these small cells are in the larger canals found straggling larger cells measuring 11.4 by 7 micromillimeters, and distinguished from the others by their brightness. Klebs takes them to be primordial ova. Furthermore, he found in the few sections he made from the rare specimen a large round cavity measuring 80 by 64 micromillimeters, and surrounded by concentric fibres of connective tissue. It contained a fine granular mass and several nuclei measuring 5 by 7 micromillimeters. Although no ovum was found in this cavity, Klebs looks upon it as a follicle.

On the left side (Fig. 104 will give a clearer idea of the organs on this side) the round ligament descends into the open peritoneal pouch containing the testicle, and spreads out on the walls of the sac. At the end

FIG. 104.



of the ovarian ligament (*I*), which here must be called a testicular ligament, is found an oval body which both macroscopically and microscopically answers to a testis. At the upper end of the testis (*A*) is found a coniform protuberans (*B*), which microscopically shows the texture of the rete testis. Inside of this body is found a bundle of

blood-vessels and nerves (*P*) corresponding to the spermatic cord, but without any vas deferens. Between this bundle and the above-mentioned ligament is seen another ligament going from the testicle to the bottom of the pouch in which the testicle is enclosed. This ligament represents the gubernaculum testis (*H*). Above the rete testis is found the epididymis, the head (*C*) forming a right angle with the tail (*D*). From the tail start the vas aberrans Halleri (*E*) and some blood-vessels going to the above-mentioned bundle representing the spermatic cord. Finally, above the epididymis is seen the tube (*K*) with fimbriae (*L*) and two small pedunculated cysts, the one (*M*) starting from the fimbria ovarica, and the other (*N*) connected by means of a peritoneal fold with the head of the epididymis, the hydatid of which it probably is.

I have given all these details because this is the best examined of all

¹ A micromillimeter, the sign for which is μ , is one-thousandth of a millimeter.

cases, but I do not agree with Klebs in his conclusion that the sexual gland on the right side is an ovary—a conclusion which is warranted neither by the external appearance nor by the structure of the body. On the contrary, it seems to me that the description of the histological composition reminds much more of a testicle than of an ovary.

There is another case of great interest which perhaps is one of true lateral hermaphrodisism. It has the advantage over the former of being that of an adult, but the disadvantage that the person in question is still living, and that consequently the nature of the internal parts is subjected to doubt. We refer to the famous Catharine or Carl Hohmann.¹ This individual has been most carefully examined by such competent observers as O. von Franqué, Rokitsansky, N. Friedreich, S. B. Schultze, and P. F. Mundé. We will use the masculine pronoun in speaking of this person, since his male nature is proved beyond a doubt, while the female is still *sub judice*. He was born in Bavaria in 1824, and spent the first forty-six years of his existence as a female. In his twelfth year the genitals and breasts increased in size, and soon afterward he began to feel sexual propensities, which at that time were entirely directed toward the male sex. At the age of seventeen he took unto himself a male lover, with whom he cohabited for twenty years. The attempts at coition were accompanied by the discharge of a thin viscid fluid from the urethra, the emission of which coincided with the orgasm and was not attended by any erection of the clitoris. Lascivious thoughts would be followed by this same emission, and sexual excitement always brought on a peculiar thrill or glow on the left side of the pelvis. In his nineteenth year a discharge of blood took place from the urethra, which for some time returned at irregular intervals and finally reappeared every three or four weeks, lasting from three to six days. This regular bloody discharge was preceded by tumefaction of the breasts, easy erectibility of the nipples, and the secretion of acolostrum-like fluid, which could be pressed out from the latter. This secretion disappeared again when he was about forty years old, and in his forty-third year the bloody discharge stopped. This periodical bloody discharge has been repeatedly watched and the fluid examined microscopically, so as to exclude every fraud. It was composed of mucus with fresh human blood-corpuscles exactly like menstrual blood. In his twenty-fifth or twenty-sixth year beard-hairs appeared, which he tore out.

In 1870 he made his first attempt at sexual intercourse as a man, and from that time he had nocturnal emissions of a fluid, the seminal nature of which has been proved with absolute certainty. It looked and smelt like semen, and on microscopical examination it was found to abound in well-shaped spermatozoids in lively movement.

¹ The name is sometimes spelt Homann (Rokitsansky) or Humann (Von Franqué).
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FIG. 105.

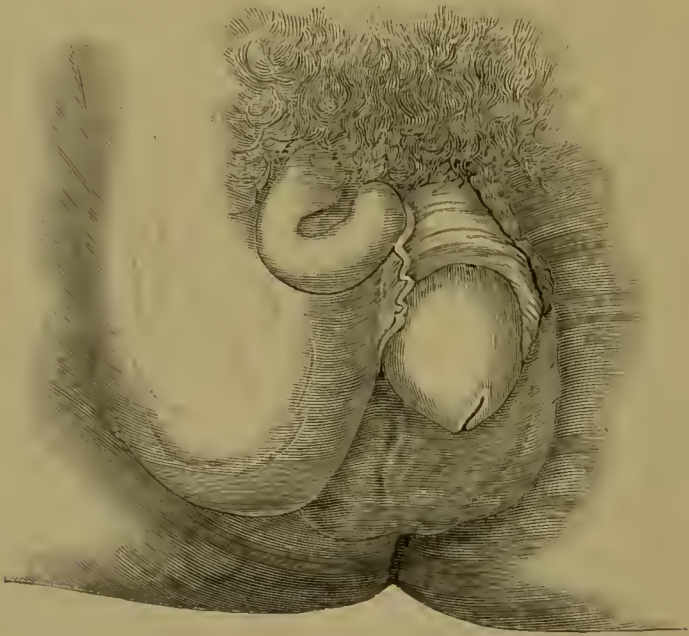


FIG. 105.—Penis and Scrotum, side view.

FIG. 106.

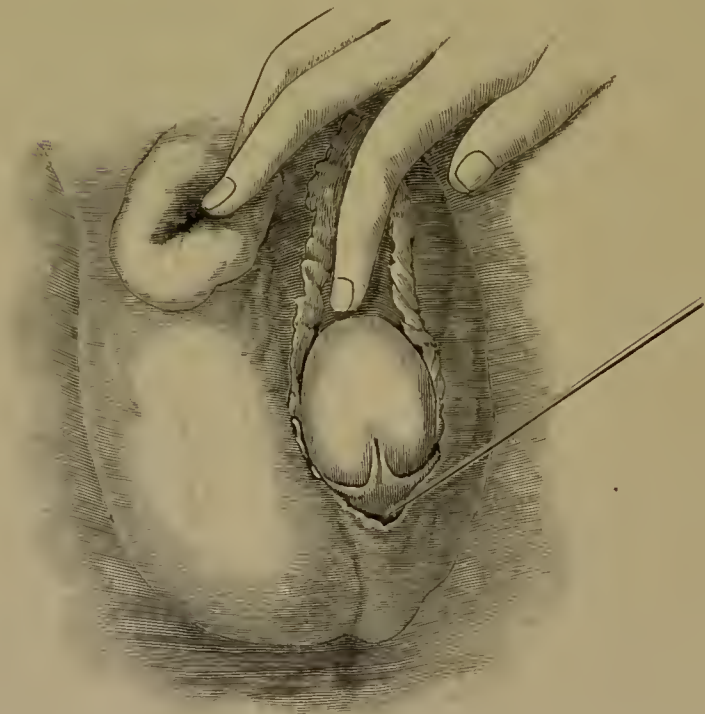


FIG. 106.—Same, more from the front, a stylet introduced into the opening of the urethra.

FIG. 107.



FIG. 107.—Upper Half of Anterior Surface, showing the breasts.

FIG 108.



FIG. 108.—Posterior Surface, showing the long hair, the slender back, the broad hips, and the finer build of the left side.

FIG. 110.

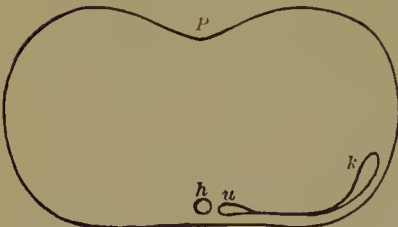
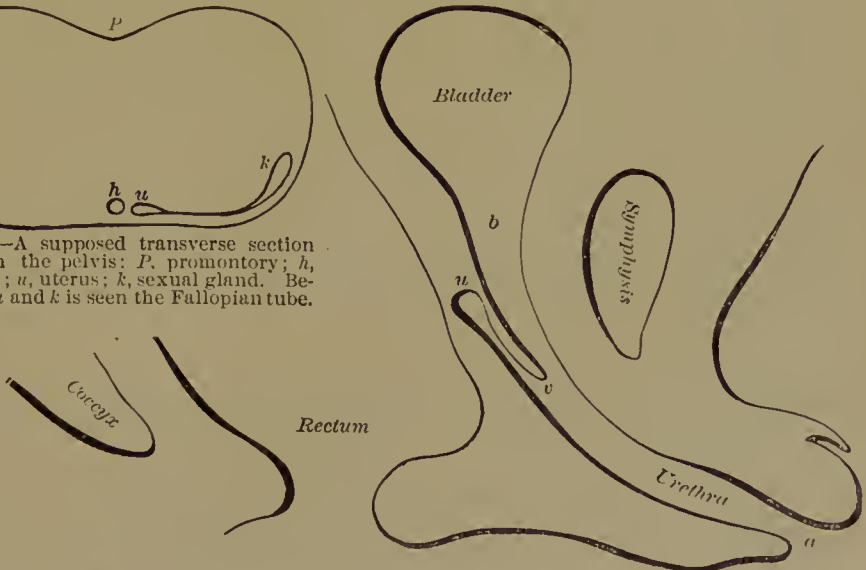
FIG. 110.—A supposed transverse section through the pelvis: *P*, promontory; *h*, urethra; *u*, uterus; *k*, sexual gland. Between *u* and *k* is seen the Fallopian tube.

FIG. 109.

FIG. 109.—A supposed sagittal section: *a*, meatus; *v*, entrance to vagina; *u*, uterus.

Here, then, we have a human being uniting the production of semen with a periodical discharge of blood mixed with mucus from the genitals. Still, it would be risky to conclude from these premises that the individual has double sex in the strict sense of the word. While the presence of a testicle is proved, that of an ovary is yet doubtful. The presence of a periodical bloody discharge from the genitals is not conclusive, since a similar condition has been found combined with normal male genitals (Rayer), and especially in males suffering from hypospadias (Th. Allen, Morand).

Carl Hohmann has later donned manly attire, has had his hair cut short, and is married to a woman. Formerly he used to have wavy, black hair, descending to the waist, as seen in Fig. 108. The left side of the face has a feminine type, and the whole left side of the body is less strongly developed than the right. The beard is slight, but distinct. He has large, well-formed breasts, with large areolæ and large, prominent nipples. The larynx is large, with prominent pommel Adams, and the voice is deep and full, but Hohmann says he sings soprano. The back has a female curve. The pelvis approaches the male type, but seems to be more capacious than in the normal male. The hips are broad and the knees converge as in a woman.

The external genitals present a masculine appearance. He has a penis, bound as far as the glans to the subjacent integument. It is two and a half inches long,¹ but during turgescence it measures five and a half inches. At the end is a blind longitudinal furrow. The urethra opens on the posterior aspect of the glans near the corona, and admits easily a sound measuring twenty-four millimeters in circumference, which passes without resistance into the bladder. Below the urethral aperture is a shallow recess covered with integument, but no trace of a vagina. On the right side there is a well-developed scrotum and testicle, with epididymis and vas deferens. The left half of the scrotum is shorter, thinner, and more like a labium majus. At the bottom was formerly found a hard mass without distinct limits, which even then was looked upon as connective and adipose tissue, and which now has disappeared. In the left groin is found a body of the size of a bean, the nature of which cannot be ascertained, but which some observers take to be an atrophic testicle, while others think it is the empty sac of a crural hernia.

From the apex of the penis two tortuous folds of skin run upward to the mons Veneris. It has been surmised that they might represent labia minora. In the preceding case somewhat similar folds were found, but there they started from a lower point—namely, from the posterior end of the long cleft frenulum, from which point they ran over the

¹ This is taken from Von Franqué's drawing. Friedreich says three inches, and Mundé one and a half.

scrotum to the root of the penis (Fig. 102). Klebs states (*loc. cit.*, p. 733) that Breisky has found similar folds in otherwise entirely normal women running from the posterior commissure to the inner surface of the labia majora.

As to the condition of the internal genitals, a medium-sized male catheter can be introduced through the urethra into a female genital canal, which deviates somewhat to the left and terminates in a button-shaped expansion (Fig. 109, *u*), the fundus uteri, from which a cord, taken to be a Fallopian tube, goes off to the left side of the pelvis, where it terminates in a somewhat movable cylindrical body several cubic centimeters large, which is sensitive to the touch, and probably is the left sexual gland; but whether it is a testicle or an ovary can only be settled by a future post-mortem examination. Thus this case as little as any other can be said to be positively proved to be one of true hermaphrodisism. (Figs. 106–110, illustrating the description, are taken from the *American Journal of Obstetrics*, 1875, vol. viii. p. 615.)

SPURIOUS HERMAPHRODISM (*Hermaphrodisimus spurius*, s. *Pseudohermaphrodisimus*).—By spurious hermaphrodisism is meant the condition in which the sexual glands belong to one sex, either masculine or feminine, and the passages leading from them, as well as the external parts, more or less approach those of the other. Spurious hermaphrodisism is subdivided according to the nature of the sexual glands into *male pseudo-hermaphrodisism* and *female pseudo-hermaphrodisism*, each of which comprises three groups, the first being formed by those cases in which the ducts alone belong to the opposite sex (*internal male or female pseudo-hermaphrodisism*); the second, by those in which the external parts alone represent the opposite sex (*external male or female pseudo-hermaphrodisism*); the third, those in which both the ducts and the external parts approach those normally found in the other sex (*internal and external complete male or female pseudo-hermaphrodisism*).

Slight aberrations, such as atresia of the vulva in the female or hypospadias and slight enlargement of the prostatic vesicle in the male, due to local disturbances during foetal development, are not counted as constituting hermaphrodisism, but it may of course become difficult to draw the line.

Pseudo-hermaphrodisism, as well as true hermaphrodisism, dates from the earliest periods of foetal development. It is much more common in the male than in the female sex, and it reaches likewise its greatest development in the former sex; so that the vagina, uterus, and tubes may be found more or less completely developed in an individual with testicles, vasa deferentia, seminal vesicles, and male external genitals.

The external genitals being formed of the same substance in the two sexes, it is not possible to have a double set of them, one male, the other

female; but some parts assume more of the one type, and others more of the other.

The general appearance of the body, especially in regard to the growth of hair, the development of the breasts, the prominence of the pomum Adami, the breadth of the hips, and the angularity or roundness of the contour of the body, presents commonly a mixture of both sexes, the preponderance being in conformity not with the real sex as determined by the sexual glands, but with the external genitals. Thus, a female with ovaries and male external genitals will, as a rule, be more like a man as to build, and a male with testicles and female external genitals commonly looks more like a female.

Literature Referred to.¹

- AHLFELD, F.: *Die Missbildungen des Menschen*, Leipzig, 1880.
 ———: "Ueber einen Monopus mit vollständigem Mangel der aeusseren Genitalien und des Afters" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 276).
 AIKMAN, JOHN: "Case of Double Uterus and Vagina" (*Am. Journ. Obst.*, 1872, vol. v. p. 380, from *Glasgow Med. Journ.*, May, 1872).
 BAER, B. F.: "A Case of Uterus Subseptus complicating the Third Stage of Labor" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 180).
 BAINBRIDGE, J. N. and W.: "Case of Enlarged Clitoris" (*Med. Times and Gaz.*, Jan. 14, 1860, vol. i. p. 45).
 BAKER, W. H.: "Malpositions of the Uterus" (*New York Medical Journal*, Dec. 1878).
 BANNON, A. P.: "On Hermaphroditism" (*Dublin Quarterly Journal*, August, 1852, No. xxvii. p. 66).
 BARNES, F.: "A Case of Labor with Atresia Vaginæ" (*London Obst. Trans.*, 1883, vol. xxv. p. 99).
 ———: "Spurious Hermaphroditism" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 188).
 BARNES, R.: "On Hernia of the Ovary" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 1).
 BASTELBERGER: "Cyste im Hymen" (*Arch. f. Gynäk.*, 1884, vol. xxiii. p. 427).
 BEIGEL, H.: *Pathol. Anat. der Weiblichen Unfruchtbarkeit*, Braunschweig, 1878, pp. 42, 43.
 ———: "Uterus unicornis dexter mit eigenthümlichen Verlauf der Tuba und des Ovariums links" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 380).
 BORINSKY, S.: "Daseine Horn eines Uterus duplex als irreponibles Hinderniss für die Extraction bei der Entbindung des andern Hornes" (*Arch. für Gynäk.*, 1877, vol. x. p. 145).
 BREISKY, A.: "Hydrometra lateralis" (*Arch. für Gynäk.*, 1874, vol. vi. p. 89).
 ———: "Pyometra und Pyocolpos lateralis" (*Arch. für. Gynäk.*, 1871, vol. ii. p. 84).
 ———: "Ein neuer Fall von Pyometra und Pyokolpos lateralis" (*Arch. für Gynäk.*, 1871, vol. ii. p. 451).
 BROWN, W. S.: "Atresia Vaginæ" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 192).
 CARTER, C. H.: "Absence of the Vagina" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 251).
 CHALMERS: "Hermaphrodite" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 239).
 ———: "Spurious Hermaphroditism" (*Lond. Obst. Trans.*, 1883, vol. xxv. pp. 129, 162).
 CHAMBERS, T.: "A Case of Congenital Inguino-ovarian Hernia" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 256).

¹ Works mentioned in the preceding article ("The Development of the Female Genitals") are not repeated.

- CLEVELAND, W. F.: "Infant of Doubtful Sex" (*Lond. Obst. Trans.*, 1868, vol. ix. p. 29).
- COEN: "A Case of Absence of Uterus and Vagina, and other Malformations" (from *Annali Universali de Med.*, Jan., 1884, in *Centralbl. f. Gynäk.*, 1884, vol. viii. p. 744).
- COPESMAN, E.: "On the Treatment of Imperforate Hymen" (*Lond. Obst. Trans.*, 1869, vol. x. p. 246).
- CROSS, E.: "A Case of Occlusion of the Vagina complicated by Pregnancy" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 809).
- DAVIES, G.: "Abdominal Cyst in a Newly-born Child" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 5).
- DAVIS, E. H.: "Case of Atresia of the Vagina" (*Am. Journ. Obst.*, 1872, vol. v. p. 396).
- DE FOREST, W.: "Case of Spurious Hermaphroditism" (*Am. Journ. Obst.*, 1876, vol. ix. p. 500).
- DIRNER, G. A.: "Ein Fall von doppelter Gebärmutter mit doppelter Scheide (Uterus didelphys c. vagina duplice)" (*Arch. f. Gynäk.*, 1883, vol. xxii. p. 463).
- DOHRN, R.: "Die Bildungsfehler des Hymens" (*Zeitschr. f. Geburtshülfe u. Gynäkologie*, 1884, vol. xi. p. 1).
- : "Ein Fall von Atresia vaginalis" (*Arch. für Gynäk.*, 1877, vol. x. p. 544).
- : "Ein verheiratheter Zwitter" (*Arch. für Gynäk.*, 1877, vol. xi. p. 208).
- : "Ein verheiratheter Zwitter" (*Archiv für Gynäk.*, 1884, vol. xxii. p. 225).
- DORAN, A.: "Deficient Development of the Uterus (*Uterus fatalis*), Atresia of the Os Externum, Atrophy of the Ovaries, Insanity" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 253).
- : "Dissection of the Genito-urinary Organs in a Case of Fissure of the Abdominal Walls" (*Journ. Anat. and Physiol.*, 1881, vol. xv. p. 226).
- : "Congenital Communication between the Rectum and the Genito-urinary Tract" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 79).
- DUNCAN, M.: "Case of So-called Imperforate Hymen" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 212).
- : "Delivery in a Case of Double Uterus" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 21).
- : "Pyometra" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 54).
- EMMET, T. A.: "A Case of Hermaphroditism" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 882).
- : "Congenital Absence and Accidental Atresia of the Vagina" (*Am. Gyn. Trans.*, 1877, vol. ii. p. 437).
- FOERSTER, A.: *Handbuch der Pathologischen Anatomie*, 2te Aufl., Leipzig, 1863.
- FORT, C. H.: "Some Corroborative Facts in Regard to the Anatomical Difference between the Negro and White Races" (*Am. Journ. Obst.*, 1877, vol. x. p. 258).
- FRANQUÉ, O. VON: "Beitrag zur Lehre über den Hermaphroditismus lateralis" (*Scanzoni's Beiträge zur Geburtshülfe und Gynäkologie*, vol. v. p. 57, Würzburg, 1869).
- FREUND, WM. A.: "Horseshoe Kidney, with Absence of Internal Organs of Generation" (*Am. Journ. Obst.*, 1876, vol. ix. p. 349, from *Berl. Beitr. z. Geb. u. Gyn.*, iv. i.).
- FRIEDREICH, N.: "Der Hermaphrodit Catharina Homann" (*Virchow's Archiv*, vol. xlv. pp. 1-8).
- GALABIN, A. L.: "Retention of Menstrual Fluid in one half of a Double Uterus" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 21).
- GARRIGUES, II. J.: "The Obstetrical Treatment of the Perineum" (*Am. Journ. Obst.*, April, 1880, vol. xiii. p. 231).
- GERVIS, H.: "Case of Transverse Septum in the Vagina" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 210).
- : "Case of Double Vagina and Uterus" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 271).

- GRACE, H.: "Case of Double Uterus, with Simultaneous Gestation" (*Lond. Obst. Trans.*, 1863, vol. iv. p. 138).
- HEGAR, A.: *Die Castration der Frauen*, Leipzig, 1878.
- HEPPNER, C. L.: "Ueber den wahren Hermaphroditismus beim Menschen" (*Reichert's Archiv*, 1870, p. 679).
- HICKS, J. B.: "An Unilateral Uterus and Kidney, with Two Ureters" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 57).
- : "Case of Congenital Abnormality of the Uterus simulating Retention of Menstrues" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 260).
- : "Five Cases of Vaginal Closure" (*Lond. Obst. Trans.*, 1863, vol. iv. p. 228).
- : "Case of Pregnancy with Double Uterus and Vagina" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 23).
- : "Vertical Septum in Lower Part of Vagina, impeding Labor" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 24).
- : "Absence of Uterus and Ovaries: on the top of the vagina a large cyst half filled with a cheesy white matter, and the rest with dark grumous material like old clots" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 262).
- HILDEBRANDT, H.: "Die Krankheiten der Aeusseren Weiblichen Genitalien" (*Billroth's Frauenkrankheiten*, vol. iii., part vii., Stuttgart, 1877).
- HOWITZ, F.: "Laparotomi for Pyometra i höjre Uterushorn" (*Howitz's Gynæk. og Obst. Meddelelser*, 1881, vol. iii. p. 70).
- HYATT, H. O.: "Note on the Normal Anatomy of the Vulvo-vaginal Orifice" (*Amer. Journ. Obstet.*, 1877, vol. x. p. 253).
- JACKSON, A. R.: "A Contribution to the Relations of Ovnlation and Menstruation" (*Journ. Am. Med. Assoc.*, Chicago, 1884).
- JOHANNOVSKY, V.: "Einige Bildungsfehler der Weiblichen Genitalien aus der Gynäkologischen Klinik des Prof. Breisky in Prag" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 371).
- KALTENBACH: "Demonstration eines Uterus unicornis mit geplatzttem gravidem Nebenhorn" (*Arch. f. Gynäk.*, 1883, vol. xxii. p. 172).
- KLEBS, E.: *Handbuch der Pathologischen Anatomie*, Berlin, 1876.
- KLOB, J. M.: *Pathologische Anatomie der Weiblichen Sexualorgane*, Wien, 1864.
- KUSSMAUL, A.: *Von dem Mangel, der Verkümmernng und Verdopplung der Gebärmutter*, Würzburg, 1859.
- LEBEDEFF, A.: "Ueber Hypospadie beim Weibe" (*Arch. f. Gynäk.*, 1880, vol. xvi. p. 290).
- LE FORT, L.: *Des Vices de Conformation de l'Utérus et du Vagin, et des Moyens d'y remédier*, Paris, 1863.
- LENTE, F. D.: "Operation for Atresia Vaginae" (*Am. Journ. Obstet.*, 1877, vol. x. p. 85).
- LEOPOLD, G.: "Ein männlicher Scheinzwitter, Pseudo-hermaphrodismus externus"¹ (*Arch. f. Gynäk.*, 1876, vol. viii. p. 487).
- : "Ueber eine vollständige männliche Zwitterbildung" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 357).
- MADGE, H. M.: "Four Cases of Congenital Imperforate Vagina, and one Case of Congenital Phymosis, occurring in the Same Family" (*Lond. Obst. Trans.*, 1870, vol. xi. p. 213).
- MANN, M. D.: "A Specimen of an Infant Uterus Bicornis Duplex and Vagina Septa" (*Am. Journ. Obst.*, 1874, vol. vii. p. 274).
- : "Case of Uterus Bicornis, with a Partial Vaginal Septum" (*Am. Journ. Obst.*, 1877, vol. x. p. 666).

¹ Since there was a vagina eight centimeters long, I think this ought rather to be regarded as a case of pseudo-hermaphrodisms maselinus internus and externus; so much more so as the examination was made on a living person, and perhaps rudiments of the uterus and the tubes may have been present.

- MAYERHOFER, C.: "Entwickelungsfehler der Gebärmutter" (*Billroth's Frauenkrankheiten*, vol. i. part 2).
- MEADOWS: "A Case of Inguinal Hernia of the Right Ovary successfully Removed" (*Lond. Obst. Trans.*, 1862, vol. iii. p. 438).
- MEYER, L.: *Uterinsygdommene som Sterilitetsaarsag*, Copenhagen, 1880.
- : *Det Normale Svangerskab, Fødsel og Barselseng*, Copenhagen, 1882.
- MOLDENHAUER: "Ein besonderer Fall von Schwangerschaft in einer einhörnigen Gebärmutter" (*Arch. für Gynäk.*, 1875, vol. vii. p. 175).
- MOSSMANN, B. E.: "A Case of Congenital Atresia of the Vagina" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 564).
- MOWAT, G.: "A Case of Apparent Absence of Uterus" (*Lond. Obst. Trans.*, 1878, vol. xx. p. 289).
- MUNDÉ, P. F.: "A Case of Single Uterus with Double Cervix and Vagina" (*Am. Journ. Obst.*, 1878, vol. xi. p. 575).
- : "A Case of Presumptive True Lateral Hermaphroditism" (*Am. Journ. Obst.*, Feb., 1876, vol. viii. pp. 615-631).
- NACKE: "Uterus bicornis septus, Vagina partim septa, Hæmatometra dextra, Hæmatosalpinx dextra, Hæmatocolpos, etc." (*Arch. für Gynäk.*, 1876, vol. ix. p. 471).
- NEUGEBAUER, L.: "Einseitige Hæmatometra bei zweitheiligem Uterovaginalkanale" (*Arch. für Gynäk.*, 1871, vol. ii. p. 247).
- NIEBERDING: "Casuistischer Beitrag zu den Gynatresien" (*Arch. für Gynäk.*, 1882, vol. xx. p. 336).
- NIELSEN, P.: "Om Atrofi af Uterus" (*Howitz's Gynækologiske og Obstetriske Meddelelser*, Copenhagen, 1884, vol. v. p. 74).
- OLSHAUSEN, R.: "Die Krankheiten der Ovarien," Stuttgart, 1877 (*Billroth's Handbuch der Frauenkrankheiten*, vol. ii.).
- OSTERLOH: "Atresia ani vaginalis" (*Arch. f. Gynäk.*, 1875, vol. vii. p. 565).
- PALMER: "Two Hermaphrodite Sisters" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 174).
- PEASLEE, E. R.: "Case of Uterus Didelphys Septus et Vagina Septa" (*Am. Journ. Obst.*, 1876, vol. ix. p. 651).
- : "Solid Uterus Bipartitus" (*Am. Gyn. Trans.*, 1876, vol. i. p. 340).
- POOLEY, J. H.: "On Imperforate Anus, the Rectum communicating with the Vagina" (*Am. Journ. Obst.*, Feb., 1872, vol. iv. p. 676).
- : "Case of Absence of the Uterus and Vagina" (*Am. Journ. Obst.*, May, 1871, vol. iv. p. 70).
- PROCHOWNICK: "Fall von Menstruatio præcox mit Sectionsbericht" (*Arch. f. Gynäk.*, 1881, vol. vii. p. 330).
- RHEINSTAEDTER: "Rudimentäre Entwicklung weiblicher Generationsorgane" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 497).
- RICHMOND, J. M.: "A Successful Operation for Atresia Vaginæ" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 600).
- ROBERTS, D. L.: "Bicorned Uterus" (*Lond. Obst. Trans.*, 1872, vol. xiii. p. 312).
- ROGERS, L.: "A Case of Male Hermaphroditism" (*Am. Journ. Obst.*, 1876, vol. ix. p. 171), from *Cincinnati Lancet and Observer*.
- ROGERS, W. R.: "Case of Vagina and Uterus divided by a Septum" (*Lond. Obst. Trans.*, 1871, vol. xii. p. 29).
- ROKITANSKY: "Verhandlungen der Wiener Gesellschaft der Aerzte" (*Wiener Medicinische Wochenschrift*, 1869, p. 724).
- ROSE, COOPER: "Case of Extravasation of the Bladder, Absence of the Rectum, the Colon opening through the wall of the Ectopic Bladder, Absence of the Symphysis Pubis, and the Development of the Uterus in Two Lateral Portions" (*Lond. Obst. Trans.*, 1874, vol. xv. p. 128).
- : "Case of Extreme Hypospadias" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 256).
- ROUTH, C. H. F.: "Case of Absence of Vagina, with Retained Menses in Utero and Fallopian Tubes" (*Lond. Obst. Trans.*, 1871, vol. xii. p. 34).

- ROUTH: "Case of Biloenlar Uterus"¹ (*Lond. Obst. Trans.*, 1871, vol. xii. p. 295).
- SAPPEY, P.: *Traité d'Anatomie descriptive*, Paris, 1857-64.
- SCHATZ, F.: "Sieben Fälle von unvollkommener Vereinigung des weiblichen Genitalkanales bei Erwachsenen" (*Archiv für Gynäk.*, 1871, vol. ii. p. 289).
- : "Ein besonderer Fall von Misbildung des weiblichen Urogenitalsystems" (*Arch. für Gynäk.*, 1872, vol. iii. p. 304).
- : "Geburt eines Monstrums. Drei Fälle von einhörnigem Uterus" (*Arch. für Gynäk.*, 1870, vol. i. p. 153).
- SCHOFIELD, R. H. A.: "The Delivery of a Monster" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 71).
- SCHROEDER, C.: *Handbuch der Krankheiten der weiblichen Geschlechtsorgane*, Leipzig, 1874.
- SIMPSON, J. Y.: "Hermaphroditism" (*Obstetric Works*, vol. ii. pp. 203-328, Philadelphia, 1856).
- SIPPEL, A.: "Ein Fall von schwieriger Geschlechtsbestimmung" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 168).
- SMITH, A. G.: "The Position of the Hymen in the Negro Race" (*Am. Journ. Obst.*, 1877, vol. x. p. 638).
- SMITH, H.: "A Case of Delivery through an Imperforate Vagina" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 117).
- SQUAREY, C. E.: "Three Sisters in whom the Uterus and Ovaries were Absent" (*Lond. Obst. Trans.*, 1873, vol. xiv. p. 212), with other cases mentioned in the discussion.
- STADFELDT, A.: "Nogle Tilfælde af Misdannelser i Genitalkanaler hos Kvinden" (*Howitz's Meddelelser*, vol. ii. p. 24, Copenhagen, 1879).
- SWASEY, E.: "An Interesting Case of Malformation of the Female Sexual Organs" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 94).
- TAIT, L.: "Hermaphroditism" (*Am. Gyn. Trans.*, 1876, vol. i. 318).
- TARDIEU, A.: *Étude Médico-légale sur les Attentats aux Mœurs*, Paris, 1878.
- TAYLOR, I. E.: "Atresia of the Vagina, Congenital or Accidental, in the Pregnant or Non-Pregnant Female" (*Am. Gyn. Trans.*, 1879, vol. iv. p. 404).
- TELLER, S.: "Repeated Pregnancy in a Uterus Bicornis" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 142).
- TURNIPSEED, E. B.: "Some Facts in Regard to the Anatomical Difference between the Negro and White Races" (*Am. Journ. Obst.*, 1877, vol. x. p. 32).
- WALKER, H. F.: "A Case of Uterus Septus and Vagina Septa" (*Am. Journ. Obst.*, 1875, vol. viii. p. 515).
- WATTS, R.: "Case of Double Vagina with Single Uterus" (*Am. Journ. Obst.*, 1877, vol. x. p. 279).
- WERNER, M. B.: "Battey's Operation Performed in a Case of Malformation of the Generative Organs" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 144.).
- WERTH: "Rudimentäre Entwicklung der Müllerschen Gänge Doppelseitige Hernia ovarialis inguinalis" (*Arch. f. Gynäk.*, 1877, vol. xii. p. 132).
- WHITTAKER, J. T.: "Agenesis Urethræ, etc." (*Am. Journ. Obst.*, 1870, vol. iii. p. 389).
- WILSON, H. S.: "Notes on a Fœtus" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 58).
- WINCKEL, F.: *Die Pathologie der Weiblichen Sexualorgane*, Leipzig, 1881.
- WITTNER: "Einige Fälle von Misbildung des Uterus," Leipzig, 1869 (*Arch. für Gynäk.*, 1870, vol. i. p. 190).

¹ Seems to be a *uterus bicornis uniforis*.

GYNECOLOGICAL DIAGNOSIS.

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THE diagnosis of disease of the female generative organs is beset by peculiar difficulties to which no other branch of medicine can, in the same degree, lay claim. The organs of generation in the female are protected from scrutiny, at the outset, by that inherent modesty which causes woman to rebel against the mere thought of examination, and furthermore, these organs are so situated that it is largely by the sense of touch, direct or indirect, that deviation from the normal is to be detected. The intimate connection also which exists between the sexual and other systems of the human body can but increase the obstacles in the way of localization of disease, necessitating, therefore, the use of the judicial faculty in a peculiarly high degree. The gynecologist hence must possess, above all, tact, delicacy of touch, and that broadness of mind which will allow of his looking beyond the organs he habitually treats, in the recognition of the fact that symptoms pointing to the uterus do not necessarily mean disease of that organ, and, what is equally true, that serious uterine disease may be masked under symptoms directing attention to some other organ of the body. The broad truth must not be lost sight of that gynecology is but a part of a grand whole. Its basis is medicine, and it is irrational to enter on its practice without ever bearing in mind that it is but a link in a complex chain, which, lengthened in time, and still lengthening, necessarily requires subdivision that each link may be better forged, each part more fitly adapted to the whole. Therefore the natural origin and the need of the "specialties," and therefore the too-little recognized truth that he will make the most successful gynecologist who has first been a general practitioner, and also that the latter cannot hope to vie with the former without thorough and systematic training in the special manipulation which belongs properly to modern gynecology.

Toward the diagnosis of disease of the female generative organs we are assisted, even as in other branches of medicine, by the history of the patient, whereby we obtain the rational signs, and by the local examination, whereby we negative or confirm the diagnosis suggested

by these rational signs. These two divisions I shall consider separately, first premising, in a general way, that the symptomatology should never carry too much weight, for woman, especially when the victim of fancied disease, will deceive not only herself, but also her physician if perchance his credulity be stronger than his judgment.

RATIONAL HISTORY.

In obtaining the rational signs it is of great advantage to proceed systematically, and to follow the same routine method of questioning in each case. For this purpose it is well to have a record-book, wherein, under appropriate headings, the obtained answers—as well as, later on, the results of the physical examination—may be recorded. Each one may construct such a scheme for himself in accordance with the manner which experience teaches him is the most appropriate for conducting his examination. I therefore do not deem it necessary to introduce one here. Sufficient the statement that, in general, our questions should, at the outset, aim at obtaining from our patient information in regard to what may be termed the etiological factors on which may possibly depend the symptoms, which, later on, she herself is to be allowed to give. Our verbal examination, hence, is first direct, and then indirect.

By direct questioning we obtain answers to the following: 1, the social position and occupation of the patient; 2, the age and state (whether married or single); 3, the number of children and miscarriages; 4, the health of parents and previous personal health; 5, the performance of the menstrual function; 6, the date of appearance of symptoms.

The answers given to these questions obviously have an important bearing on the further history of the case, and will govern us, in a measure, in our decision as to the necessity of a local examination. With the maiden, for instance, we may usually at once eliminate diseases the followers of childbearing and of impure or inordinate coitus, and direct our questions toward ascertaining the state of the general health and the performance of the menstrual function. Knowledge of the social position and occupation of our patient is of value, since, obviously, that which is laborious or of a confined nature is apt to impress alterations on the system either general or local, and since, too, habits of indolence or of luxury carry ills in their train, largely, in these days, owing to the pernicious method of dress which is in vogue. The age of our patient is particularly of value, as allowing the exclusion of those new growths the tendency toward which increases with age, as also as indicating to us, in certain cases, the prognosis as regards, it may be, sterility, it may be the disappearance of some symptom the

relief from which may only be looked for at the menopause. The state and the age together are to be taken into consideration in our decision as to the necessity of a local examination ; and I would say here that in the unmarried it is exceptional that an examination is requisite until general constitutional measures have been tried without avail. Of course I exclude from this dictum emergencies, such as sudden hemorrhage or symptoms pointing so clearly to the sexual organs that our past experience teaches us it is but folly to temporize.

With the married, on the other hand, whilst we must guard ourselves against the assumption that there necessarily exists disease of the generative organs, our line of questioning must be widely different. The fulfilment of the purposes for which marriage was instituted too frequently entails functional or organic derangement, and, as it is our business to use every proper means for the detection of abnormalities, we need not be too chary in our speech—indeed, must sometimes, to fulfil our whole duty, even ask questions which touch upon the most delicate possible ground. Such are—the frequency of intercourse, the sensations evoked, the completeness or incompleteness of the act, the retention or non-retention of the semen : these are questions the answers to which will frequently give us a clue to the cause of menstrual derangement or the possible cause of sterility.

If the patient be married, information must next be sought in regard to the number of children or miscarriages she has had, of the interval which has elapsed since the last delivery, as to the duration of the several labors, instrumental interference, length of the puerperium, and incidents peculiar to it. We are thus often led to suspect that our local examination will reveal some injury to the genital tract, or pelvic exudation recent or chronic—a suspicion which obviously influences strongly in the decision as to the necessity of a local examination. It is important also to question our patient in regard to the function of lactation, on account of the very decided influence which its due and proper performance has on uterine involution. In case of one or more miscarriages, we must determine as accurately as possible the month at which they occurred, ascertain the probable cause and the manner of care the patient received, and, where habit is the probable factor, seek behind this convenient term for the real factor in order to scientifically bring to bear on its cure every possible means at our disposal, including, of course, examination and treatment of the husband in those cases, by no means infrequent, where he must bear the partial or entire onus of premature blighting of the ovum. In this connection, too, it should ever be borne in mind that the abuse—or, strictly, the use—of certain means for the prevention of conception at such times when offspring are not desired frequently acts like a double-edged sword, and through its injurious effects on the sexual organism prevents the bringing to term

of the ovum which has been fructified designedly. These means may, therefore, be indirectly responsible for miscarriage, so that the question is pertinent whether they are resorted to.

Inquiry in regard to the health of our patient's parents is too often neglected, and yet is of great importance. Whilst the influence of heredity has never as yet been distinctly formulated, there are sufficient data at our disposal to warrant the assertion that ancestral disease may so modify the nutrition and configuration of the offspring as to render it more accessible to disease, even if this be not directly implanted. The so-called serofulous taint may unquestionably, in a latent form, be responsible for deviation from health in the genital system, even as it is in other departments of the body; and the like holds true of other constitutional diseases which we are prone to look upon as hereditary. I rank this question as an important one advisedly, because I know that through a proper appreciation of its import very frequently the prognosis and the treatment of apparent disease of the genital system will depend upon and lie through constitutional measures rather than local.

And this remark holds true as well of an associated question—the previous state of health of the patient herself. Much valuable information, and in an obscure case very necessary, may be gleaned from close questioning on this point. A sore throat and loss of hair following closely on marriage may, in the absence of certain positive signs, but taken in connection with slight negative, offer a probable explanation for frequent miscarriage. The parenchymatous degeneration of the muscles which accompanies high febrile states not improbably may modify the organs of generation sufficiently to prevent their normal function. These remarks are simply made to indicate the line of thought which answers to this question might suggest: to discuss the subject at length would lead me entirely too far.

We are next to obtain the menstrual history of our patient. In the young and unmarried it is usually derangement of the menstrual function which brings the patient to the gynecologist—it may be amenorrhœa, it may be irregularity in, or pain during, the performance of the function. These are the very cases in which there is difficulty, especially, in deciding as to the necessity of a local examination. I would again strongly deprecate recourse to a local examination in the unmarried before the special features of the case have been carefully sifted, and varied and prolonged attempts have been made by means of general constitutional measures to relieve what, in the young and growing maiden, is often due to method of life or to chlorosis. Nothing but very urgent symptoms should justify local examination of the young girl who has scarcely passed the pubescent period. In her, derangement of menstruation, such as skipping a period, dysmenorrhœa, con-

gestive signs due to scanty flow, are not necessarily pathological factors. It takes time for the menstrual habit to become regularly and normally acquired; and where an examination is needlessly resorted to an unlooked-for effect may be profound injury to the maiden's *morale*. There is, however, a group of symptoms which should ever speak in favor of a local examination, and this is constituted by the conjoined factors amenorrhœa, congestive signs, and molimina. The regular recurrence of these symptoms should suggest possible occlusion of the vagina with retention of menses—a condition calling for early resort to operative interference.

Our questions concerning menstruation should be in regard to the age at which the function was established, the regularity with which the flow recurs, the duration, amount, and character of the flow, the presence of pain before, during, or after the flow, and the date of the last menstruation. If amenorrhœa be complained of, we should always bear in mind the physiological cause, and suspect pregnancy until we have for ourselves disproved it. In exceptional cases, however, amenorrhœa will only apparently exist, for on close questioning the fact will be revealed that for a number of days each month there is an increased white discharge which the patient takes for an aggravation of her leucorrhœa, but which the physician, in case there be accompanying molimina, will recognize as the so-called white menses, and thereby essentially modify his prognosis. The presence of molimina also assists us in our diagnosis and prognosis of those cases of amenorrhœa where the local examination reveals an undeveloped state of the uterus or ovaries. The number of days during which the flow lasts, its amount (determined in our better classes by the average number of napkins worn), the presence of clot or of membrane in the flow,—are all questions bearing on our diagnosis and ultimate method of treatment. If menstrual pain be complained of, it is important to time its rhythm—that is to say, to determine whether the pain precedes, accompanies, or follows the flow—for thus we are in a position to decide whether the probable cause be uterine or ovarian. It is almost superfluous to state that it is always essential to know the date of the patient's last period, although undue weight is never to be given to her statement on this point should the local examination give us cause to think that the patient is either endeavoring to deceive us, or else that the discharge at the last stated period occurred notwithstanding the presence of an impregnated ovum within the uterus.

The last question, the length of time since the appearance of the symptoms, has in part an etiological bearing and in part a diagnostic. In the young unmarried female a common starting-point of symptoms is imprudence during menstruation. By imprudence I refer not alone to the neglect of avoidance of causes which result in checking this phys-

iological function, and yet such a disagreeable function in so far as it often interferes with the plans and wishes of, especially, our young maidens of higher social life: my meaning is still broader, including as it does the general neglect of proper rest, both mental and physical, at the time of the periods the most critical of all—the year or so following the establishment of puberty. Derangements of menstruation, chronic congestion and displacements of the pelvic organs, ovaralgia and ovaritis,—such, in their *ensemble*, are the pathological factors which may be traced to neglect of rational precautions during menstruation. In the married, symptoms very frequently may be traced to abuse of the sexual act. This is particularly noticeable in the newly-married, in whom symptoms will be found to depend on the constant state of congestion in which the pelvic organs are kept. Thus are explainable, often, menorrhagia dating from the time of marriage, ovaralgia, back-ache, dragging pains in the abdomen, vague hystero-neurotic symptoms. A further cause of symptoms in the married is the resort to means for the prevention of conception—in particular, I believe, vaginal injections taken immediately after the sexual act, and in such haste that the temperature of the water is not attended to, and in consequence the congestion naturally following the sexual act receives sudden and harmful check. Again, the measures resorted to by far too many married women to destroy the undesired fruit of the womb obviously can but react unfavorably on the pelvic organs. Abuse of function invariably leads to pathological alteration: in order to determine, therefore, the degree to which pathology has affected the sexual organism of our patients it is necessary to know not only the cause of symptoms, but, as far as possible, the length of time during which such cause has been at work. Thus it is that even through questioning which bears more particularly on etiology we are assisted toward correct diagnosis.

I have now sketched briefly the nature of what may be termed the preliminary questions, and I pass to the consideration of symptoms of which the patient complains or which are drawn out by the examiner. And here I would remark that there are but few symptoms which singly can properly be regarded as peculiar to disease of the female pelvic organs. It is only, usually, when taken in their *ensemble* that they justify the inference that there exists organic or functional derangement. And even as symptoms of themselves are so deceptive, so too should we carefully gauge our patient, lest she endeavor to deceive us for a purpose or is in reality deceiving herself. Desire for sympathy, the impulses of hysteria, the wish which is often the father to the thought,—are each incentives in the making of a plausible history, the worth of which it rests with the physician to decide. I do not mean that he is not to give credence to the symptoms unless he can find a cause; I would simply warn against allowing a skein of symp-

toms skilfully woven to lead the perception and judgment away from that which really exists. It is well too to allow the patient to tell her own story—a tedious method, certainly, but one through which we are more apt to reach the exact truth than if leading questions were put. Of course, after the patient has told us all she can or will, it rests with the examiner to fill in the gaps, and thereby possibly obtain information which has been concealed.

In general, the symptom which ordinarily drives the patient to consult the gynecologist is pain. This pain may be in various parts of the body, and it is its association with other symptoms emanating from, or so situated as to suggest their origination in, some portion of the genital system which attracts attention to the pelvic organs. Pain in the back, lumbar or sacral, is a symptom common to the majority of women, and evidently its cause may be entirely independent of the uterus or its adnexa. The lifting of heavy weights, occupations which require prolonged flexion of the trunk on the pelvis, the injudicious use of the sewing-machine,—these are amongst the possible causes which, if persisted in, undoubtedly will lead to local pelvic disorder. When the pain is chronic, however, sacral in site, and particularly when it is associated with dragging or bearing-down sensations in the abdomen, then it rises to a higher level as a diagnostic factor, and our local examination will in all probability reveal some displacement of the uterus, injury to the pelvic floor, or interference with the circulation through the pelvic organs. Pain in the nates, running down the dorsum of the thigh, will usually find its explanation in sciatica, but if other factors in the history point to recent or chronic inflammatory pelvic exudate, this pain may find its explanation in the same cause. Pain in the abdomen is next in frequency to pain in the back; and here we must determine its site, its constancy and duration, and its nature. Suprapubic pain will direct attention to the bladder, and it will remain for future examination to determine whether this organ is directly at fault, or indirectly through the mechanical pressure of the uterus or a foreign growth. Diffuse abdominal pain, accompanied by distension, suggests intra-abdominal growths or fluid or affections of the peritoneum. Pain in the iliac or ovarian regions is a frequent symptom; and this pain is more frequently situated to the left than to the right. While the local examination may reveal ovarian or obscure tubal disease, this pain is often present without adequate explanation, so that its exact value as a diagnostic factor is not settled. In character it is usually either burning or lancinating; and in the latter instance we will often be led to surmise tubal disease. In a large proportion of cases I have found pain in the left ovarian region dependent purely on chronic constipation, as evidenced by the fact that the pain entirely disappears on the patient acquiring the habit of daily defecation. The

explanation, of course, of this association of pain and loaded rectum is simple when we remember how closely adjacent to the rectum lies the left ovary, and how this latter organ will naturally suffer from the pressure of the feces and from irritation by the scybala as they pass downward. A curious point in connection with pain emanating from the ovaries is that the site of the pain not infrequently does not correspond to the affected organ. In other words, a left ovaritis is often accompanied by pain in the right ovarian region, and *vice versa*.

Pain from both the back and abdomen frequently extends into the legs, and is to be considered as purely reflex in nature. Abdominal pain above the umbilicus will suggest, of course, organic or functional derangement of one or another of the abdominal viscera according to its site, although here as well the pain may be reflex from the pelvic organs. If, instead of pain in the abdomen, enlargement is complained of, our object should be to ascertain the length of time the enlargement has existed, in what portion of the abdomen it first began, whether it be permanent or not. The importance of these questions is apparent, particularly in connection with the differential diagnosis of abdominal tumors.

Pain in the head can scarcely lay claim to a place in the symptomatology of disease of the pelvic organs, unless it be on account of the frequency with which women complain of it. Its cause in the majority of instances is constipation or chronic congestion of the pelvic organs; and in these instances the site of the pain is usually the occiput. Rarely a hemicrania will apparently depend on inflammation of one or the other ovary, as is attested by its disappearance as the inflammation abates.

Pain in the chest, if neuralgic, may emanate from disorder of the pelvic organs, but usually this symptom will call for careful auscultation and percussion at the hands of the gynecologist, even as it would were the patient instead consulting a general practitioner. Shooting pains through the mammae and enlargement of these organs will suggest at once pregnancy, but both these symptoms may accompany uterine or ovarian disease.

Pain in sitting should direct attention to the coccyx, or it may result from anal or rectal trouble; and the aggravation of sacral or abdominal pain in standing or walking bears testimony to the probable existence of some uterine displacement or sagging of the pelvic floor.

Pain on coitus, or dyspareunia, is a symptom which ordinarily the patient will not mention of her own accord. This symptom is a frequent cause of marital infelicity, and is therefore a sufficient justification in itself for requesting a local examination. The cause we are not always able to discover, but often, aside from disproportion in size between the male and female organs, the local examination will reveal

caruncles of the urethra, a displaced uterus or ovary, a simple hyperæsthesia at or within the ostium vaginae, an anal fissure, or rectal disease.

From the intimate sympathetic relations between the stomach and the pelvic organs pain in the epigastric region is a frequent symptom. Obviously, this pain may depend on organic disease of the stomach, and calls for careful differentiation on the part of the gynecologist. A dyspepsia purely functional in character, however, and evidenced by either simple pain or by nausea or vomiting, will frequently be of reflex nature from the pelvis, and will suggest in the first place pregnancy, particularly if these symptoms are matutinal and before eating; and in the second place, ovarian disease. Of course these symptoms may result from mechanical pressure of some abdominal tumor on the stomach, but then there will be the further history of abdominal enlargement, and our local examination will readily detect the cause of the digestive disturbance.

Symptoms pointing to the bladder and the rectum are too frequently denied the importance they deserve. It is a fact on which sufficient stress cannot be laid that disease situated in the latter organ may, especially in symptomatology, very closely simulate disease of the reproductive organs, and the neglect of a proper appreciation of the bladder symptoms may lead the gynecologist far astray from the existing pathological factor. Whilst I cannot go so far as to say that a chemical and microscopical examination of the urine should be made in every case, the same rule will hold in gynecology as in other departments of medicine—that the history of no case is complete until such an examination has been made. Certainly, in a case at all obscure we may thus become possessed of very valuable information, and therefore every gynecologist should be informed in regard to the manner of properly examining the urine. Women, as a rule, are able to retain their urine longer than men—not that the capacity of the bladder is so much greater, but largely through the educational force of habit. Frequent micturition, therefore, is a symptom very likely to attract their attention, and it is surprising how frequently one hears the complaint without being able to formulate a cause. Mere frequency, aside from lesion of the kidneys, will usually result from mechanical pressure, perhaps of the uterus, perhaps of a foreign growth. Frequency of micturition associated with scalding suggests a variety of causes, such as some derangement of the urine, or cystitis, caruncles of the urethra or at the meatus, or fissure of the neck of the bladder. Vesical tenesmus suggests the same causes, as also, not uncommonly, a purely hyperæsthetic state of the few muscular fibres which constitute the so-called sphincter of the bladder. Sacculatation of the posterior bladder wall into the vagina or the same condition of the urethra, cystocele and urethrocele, are frequent causes of trouble in micturition, owing to the irritation of the

residual urine in these artificial pouches. Calculus in the female is a further cause, giving rise to the same symptoms as in the male. It is not alone sufficient, however, to determine the frequency with which micturition is performed and the presence or absence of pain, but we must also question our patient as to the color of the urine and as to the presence of any noticeable sediment. It goes without saying that constant dribbling may mean, in the female even as in the male, hyperdistension of the bladder. If retention be complained of, especially if of recent occurrence, the thought of acute displacement of the uterus at once presents itself, and the local examination will verify our suspicion.

In regard to defecation, we should never rest satisfied with the statement that the bowels move regularly. Women have very peculiar ideas in regard to the normal performance of this function, it being no uncommon thing for this necessary demand of nature to be satisfied only at intervals of days. Our questions, therefore, must be direct as to whether the act is a complete one, as to the presence of blood or mucus in the stools, as to the presence and site of pain before or after the act, as to the regularity with which defecation is performed. The answers to these questions will frequently suggest the cause of ovarian pain previously complained of, foretell the existence of an anal fissure or rectal ulcer, and point to the presence of rectal disease which otherwise might be overlooked in our eagerness to explain the symptoms through derangement in the sexual system.

The presence of vaginal discharge next claims consideration. It is not sufficient to know that our patient has a discharge: the amount, the color, the consistency, the odor, the persistence of this discharge, are each factors of assistance in diagnosis, and direct questioning is usually necessary to obtain the desired information. The mere presence of discharge is not sufficient justification for a local examination. A certain amount is physiological, and it should ever be borne in mind that disordered conditions of the blood may give rise to a leucorrhœa, even as disease of the vagina or uterus will. In general, a discharge trifling in amount, whitish in color, of watery consistency, and odorless, will yield to constitutional measures, and in the maiden the above conditions should ever receive general treatment before subjecting her to local examination. When, on the other hand, the discharge is tinged with blood or discolored yellow, the inference is that local disease exists, such as erosion of the cervix or inflammation of the endometrium; when, again, the discharge is sticky, we may at once assume that the muciparous follicles which line the cavity of the cervix are secreting abnormally as the result of disease of the cervix; when, further, the discharge is thick and creamy and associated with painful micturition, we think of disease of the vagina, possibly of an infectious nature;

when, finally, the patient tells us that the discharge is very offensive, malignant disease or necrosis of a benign growth suggests itself. In women who have passed the menopause the source of a discharge should always be sought for locally, and, if watery and acrid, will be found to depend on atony of the vagina, resulting in the so-called senile vaginitis; if of the nature of a hemorrhage or foul, on malignant disease. It by no means follows, however, that a patient has no discharge because she says so. Certain women do not notice a discharge, and yet complain of pruritus—a symptom which of itself suggests a discharge—and the local examination will frequently in such cases reveal a leucorrhœa and its cause. If not, the urine should at once be examined for sugar, since pruritus of obscure origin not uncommonly is symptomatic of diabetes, in which event there probably exist the further symptoms of loss of weight and polydipsia.

There remain now to be enumerated those variable and varying symptoms which properly belong to women advanced in life, and which are grouped within a few years preceding and following the menopause. The pains and the aches are manifold, the hot flashes and the cold spells of frequent recurrence, and it is from the multiplicity and variability of the symptoms, taken in connection with the patient's age and menstrual history, that we are enabled to reach our diagnosis, and feel justified in applying to the symptoms that vague but convenient term, *hystero-neurosis*. Obviously, in these cases, a local examination will usually reveal nothing abnormal, and we should guard ourselves against making one without stronger reason than these symptoms justify; for our object should be not to attract but to distract the attention of these patients as far as possible from the sexual organs. Characteristic also of this time of life are the hemianesthesiæ and hyperæsthesiæ, the periodical swelling of the abdomen, the lump in the throat, etc., which, while symptomatic of serious organic disorder to the patient, are readily recognized by the physician as neither of central origin nor of grave import, but as accompaniments of that functional disorder to which the old term "*hysteria*" must needs still be applied.

I have now outlined the method after which we should obtain the rational history, the nature of this history, and the bearing which individual factors should have in determining us toward making a local examination. If, then, the symptoms justify, we thereby proceed to obtain our physical signs, which, taken in conjunction with the rational, go to form our diagnosis and to construct our prognosis.

PHYSICAL SIGNS.

The physical signs are obtainable through the local examination. Before proceeding to this, however, it is essential to obtain what infor-

mation is possible from a study of the appearance of the patient. By this I mean to search for the signs which point to anæmia, chlorosis, acquired or inherited constitutional disease. Should the rational history have directed attention to the thoracic organs, careful auscultation and percussion should be resorted to. Such a preliminary physical examination requires but a moment's time, and yet may reveal signs which will amply explain the rational history and negative for the time, perhaps render entirely unnecessary, recourse to a local examination. The face should be questioned for the almost characteristic markings of ovarian or malignant disease. In the unmarried particularly, where the rational history or a glance at the configuration of the abdomen suggests the possibility of pregnancy, a step preparatory to requesting a local examination is inspection of the breasts—not that the absence of mammary signs should cause us to negative the possibility of gestation, but because the presence of such signs, taken in connection with the local findings, will frequently assist us in forming an opinion. In a word, the routine rule should be to obtain every possible sign before the local examination is resorted to, because we never know beforehand how simple or obscure the case may turn out to be, and in the latter instance any detail, however trivial, may be of marked assistance.

In order to make a thorough and careful local examination the gynecologist needs, above all, a properly-constructed table on which his

FIG. 111.



Chadwick's Table (for dorsal position).

patient may recline with comfort, and which may be readily adapted to the necessities of both the dorsal and left-lateral position. I dismiss from consideration the many complicated chairs and couches offered to the profession. These are usually needlessly elaborate, and therefore expensive. An ordinary table with gentle slope backward, provided with foot-rests and with hair mattress or other covering, of sufficient height not to strain the examiner, is the simplest and cheapest, and answers every purpose, except in the left-lateral position, where, in the absence of an

attendant to hold the speculum, a lateral inclination of the top of the table is practically a necessity. Any carpenter may construct such a table, and therefore the physician, whose taste or means does not

FIG. 112.



Chadwick's Table (Sims's position).

necessitate or allow a handsomely appointed or upholstered article, need not be deterred from possessing one of the prime prerequisites to a thorough local examination. Those who desire something handsomer,

FIG. 113.



Thomas's Table as modified by Dr. B. H. Dagget (for dorsal position).

however, will find the table devised by Thomas, or one of its modifications, well adapted for gynecological work. Among the best modifi-

cations¹ are those of Chadwick, of Goodell of Philadelphia, and of Dagget of Buffalo. The great objection to Chadwick's table is the lack of mechanism for obtaining the lateral inclination. It should be remembered that the office lounge or sofa is simply a makeshift, and the physician will find that it rarely requires any persuasion to induce his patient to recline on his table, provided she be assured that no unnecessary exposure is entailed.

Next in importance is the securing of the proper position, as will be noted farther on, and preliminary to the position is the loosening of the corsets and clothing, so that the abdomen may be readily accessible to

FIG. 114.



Thomas's Table as modified by Dr. B. H. Dagget (for Sims's position).

the examining hand and free play of the abdominal muscles secured. The advantage of a good light is of course obvious.

The local examination should be made in stages, so to speak, and these I shall describe separately and in succession according to the following scheme :

A. THE DORSAL POSITION : 1. Inspection ; 2. Digital examination ; 3. Bimanual examination ; 4. Instrumental examination ; 5. Rectal examination and conjoined rectal ; 6. Abdominal percussion, auscultation, mensuration, and palpation.

B. THE LEFT LATERAL OR SIMS'S POSITION : 1. Digital examination ; 2. Instrumental examination.

¹ A. G. Armstrong of Ashtabula, O., makes a table on the same general principles, but rather too complicated.

C. THE GENU-PECTORAL POSITION.

D. THE ERECT POSITION.

THE DORSAL POSITION.—It is from this position that the examiner frequently secures his most important information, and the examination, therefore, should be made with the greatest possible care, since the facts noted will vary *pari passu* with the deliberateness used and the education of the examining finger. The patient should lie on her back, her head resting on a low hard pillow, her nates at the very edge of the table, her thighs gently flexed on the pelvis, her feet resting in the foot-supports. She should be covered by a sheet, and this may be raised or suitably arranged for the purposes of the first step—*inspection*. This includes the abdomen, vulva, perineum, and anus. As a routine measure it is not necessary, at the outset, to inspect the abdomen. Only where there exists obvious abdominal enlargement is it advisable to begin with inspection of this portion of the body. Usually we await the result of the digital examination, including the bimanual, before resorting to this measure, for in the large proportion of cases it is unnecessary. Should its necessity be apparent, then, in connection with inspection of the abdomen, we must frequently resort to auscultation and percussion, so that it will be more convenient to speak of this measure later in connection with the other two.

Inspection of the external genitals should, at the first examination, never be neglected. Much valuable information may thereby be obtained, aside from the necessity of the physician protecting himself against the transmission of pediculi or, above all, specific disease. The hair surmounting the mons Veneris, therefore, should be looked at, and suspicious sores sought for in every case, no matter what the social condition of our patient, before resorting to any further examination. Erythema, eruptions, the evidence of scratching, the state of the labia as regards swelling or abnormal development, are points which are quickly taken in at a glance, and suggest irritating discharge, disease of the vulva or its glands, the habit of self-abuse. The labia are now to be gently separated and the vestibule investigated. The points to be noted are, successively, the clitoris and its development; the meatus urinarius—in regard to eversion of the mucous membrane of the urethra, the presence of discharge or of caruncles; the hymen—whether intact, distended, or torn; the amount of discharge present in the vestibule—its color and consistency; the traces which parturition almost invariably leaves at the posterior commissure. It is advisable at this point to request the patient to strain or bear down, and to note the effect which this act has on the perineum and anterior or posterior vaginal wall, for thereby we are informed in regard to the tone of the pelvic floor, as well as in regard to the existence of sagging of the vaginal walls. The finger—preferably the left index, although it is

of great advantage to train ourselves to use the right index as well—should now be introduced into the vagina; and this brings me to the consideration of what may be learned from the *digital vaginal examination*.

Whilst inspection may be performed sitting, or, preferably, standing a little to the right of the patient, the digital examination can only properly be made when standing between the patient's everted thighs. The finger, previously anointed with oil—or, what serves the same purpose and is more cleanly, with soap—should ever be introduced from below upward, due care being taken not to carry along with it any of the hair which frequently profusely covers the organs of generation. It should be introduced carefully, so as to give rise to no unnecessary pain, and should note in succession the elasticity of the hymen if it still exist, the presence of spasm, the temperature of the vagina, the state of its walls whether rough or smooth, the direction of the canal, the elasticity or tone of its walls. It may be well to state that my remarks at this point concern more particularly the married, for in the unmarried a vaginal examination should, in general, be preceded by the rectal, as will be noted under that heading. The finger has now reached the upper vagina, and more space for investigation may be gained by gently but firmly depressing the perineum. The cervix is next to be examined in regard to shape, density, size, direction, length, and sensitiveness.

The majority of these factors materially assist us in diagnosis. The *shape*, for instance, will often at once suggest a cause of sterility, as where this is conical. By the *density* we differentiate the softening *en masse*—gravidity, the softening around the external os—erosion, the hard fibrous feel suggestive of advanced hyperplasia or of scirrhus cancer, the large heavy cervix accompanying subinvolution. By the *direction* we gain an idea of the probable position of the corpus uteri, which our next method of examination is needed to confirm. The position and condition of the external os are to be carefully noted, especially as to whether it be lacerated or not, and, in the first instance, as to whether the rent be unilateral or bilateral, the depth to which the rent extends, and the sensitiveness at the angles of the rent; and, in the latter instance, as to the shape of the os, parous or not, and as to the patency in degree and extent. This is all the information which the unaided internal finger can to advantage glean. It may, of course, pass to the vaginal vault, but any exact determination of the conditions there present and of the organs adjacent to it must await our next step—the *bimanual or conjoined examination*.

It is only in comparatively recent times that the necessity of the bimanual examination has been recognized and insisted upon. Now-a-days no examination is complete, or even approximately correct, unless this

method has been systematically used. Exceptionally only, as where there is great adipose development of the abdominal walls, inflammatory disease, or such hyperæsthesia on the part of our patient as to interfere with sufficient depression of the abdomen, is it impossible to resort to this manœuvre; and in such cases, in order to complete our diagnosis, it may be necessary to resort to anæsthesia. Otherwise, however, if the patient occupies the proper position, as already described, and the examiner makes gentle but steady pressure in the right direction, the contents of the pelvis and the topography of its contained organs may be accurately studied. To perform the bimanual, the examiner stands between the patient's everted thighs, the bladder having, if necessary, been previously emptied; places his hand, preferably the right, on the abdomen about midway between the umbilicus and the pubes, and with the fingers makes pressure in the direction of the axis of the pelvic inlet, counselling his patient to breathe quietly and to relax her abdominal muscles as much as is in her power. His external hand will thus readily come upon the fundus of the uterus, if this organ be in fair position or anteriorly displaced, or else will meet the internal finger, which should be resting in the anterior cul-de-sac. This cul-de-sac should now be explored for evidence of thickening in the vagino-vesical space, for the presence of a body which further examination must distinguish as the fundus uteri, or tumor, or, exceptionally, an anteriorly displaced ovary. If this body be continuous with the cervix, if motion imparted to it be communicated to the cervix, if further exploration posteriorly to it reveal no other body, we are assured that it is the fundus. If, on the other hand, we find another body posterior to it, in connection or separate, we immediately think of a tumor in the anterior fundal wall, loosely connected with or independent of it. Then it may be necessary, as noted farther on, to resort to the sound for differential diagnosis. If this body, however, be small and sensitive, the ovary, out of position, suggests itself. The finger in the anterior cul-de-sac should further seek for an angle of flexion formed at the junction of the cervix and body of the uterus, and should note the elasticity of the cul-de-sac and its depth. The internal finger should now pass successively to the left and right lateral culs-de-sac, the external hand bringing the organs which lie in these regions within reach. These regions are to be explored especially in regard to density, thickening, or fluctuation, suggesting recent or chronic inflammatory processes, or alterations, inflammatory or not, in the ovaries, tubes, or layers of the broad ligaments; and now, too, if the patient be spare or there be sufficient relaxation of the abdominal muscles, the ovaries may be felt if in their normal position, and they are distinguished by their size, shape, and by the peculiar sickening pain which pressure almost always will evoke. If the uterus be later-

ally displaced, the fact may be detected whilst these lateral regions are being explored. The finger should now pass to the posterior cul-de-sac, and, under favorable conditions, the abdominal walls may be sufficiently depressed to allow the external hand to meet it there. The elasticity of this cul-de-sac should also be tested, evidence of acute or chronic exudation sought for, the posterior ligaments of the uterus tested for thickening, the depth of the cul-de-sac noted, and, even as in the examination of the anterior cul-de-sac, the nature of any body differentiated as the fundus, or tumor connected with or independent of the fundus, and an angle of flexion is also to be sought for. Here, too, the sound may be necessary to make the differential diagnosis, although ordinarily the conjoined fingers will suffice. Douglas's cul-de-sac is also a favorite resting-place for prolapsed ovaries, and, as before, these may ordinarily be distinguished by their size, shape, and sensitiveness. Scybala in the rectum can only be mistaken for ovaries by the careless examiner. The next step is to test the mobility of the uterus, to estimate its size and its shape, and the relation as to direction this body holds to the cervix. The mobility is ascertained by placing the internal finger on the cervix and pushing this in various directions, or, if the uterus be not so displaced backward as to render the step impossible, the external hand may grasp the fundus and tilt it backward or forward or laterally. At the same time the shape and density of the organ are estimated, and any unevenness of its walls noted. When movement is imparted to the uterus, the examiner is to note if pain is thereby given to the patient, and as to how much the sphere of mobility is impeded in one or another direction according to the conditions present which interfere with what his experience teaches him is the usual range of motion.

It should never be forgotten, in estimating the probable relation existing between symptoms complained of and uterine position, that there is absolutely no fixed standard whereby the uterus may be judged to be in or out of position. In regard to "the normal position of the uterus" every woman is a law unto herself. The uterus has a range of normal positions, and this range will vary in each woman according, on the one hand, to the symmetry of her pelvis, and, on the other hand, to the length of the ligaments which nature has supplied to the organ to act as checks against its assuming a position which will—indeed, must—evoke symptoms. And in this word "symptoms" we strike the key-note of diagnosis of abnormal uterine position. Obviously, the uterus may in one woman lie, for instance, farther forward than in another without giving rise to symptoms from the side of the bladder; and this for the reason that her pelvis is more capacious, or her bladder less intolerant of interference, or the retro-uterine ligaments longer; and a like train of reasoning will apply to backward or down-

ward displacement. It is not sufficient, therefore, for the examiner to conclude that the uterus is ante- or retroverted in a particular case because one or another authority states dogmatically that the like position is abnormal; but he must seek farther as to whether the position which he determines will account for the symptoms. If not, the position is not abnormal for this particular woman. I would further lay stress on the fact that, ordinarily, the bimanual examination alone will tell us sufficient in regard to the position of the uterus and its mobility to render recourse to instrumental means unnecessary.

Closely connected with the bimanual are other methods of conjoined manipulation, such as vesico-rectal, recto-abdominal, vagino-rectal. The purposes of these manipulations, their indications, and the information to be thus derived will find an appropriate place under the next heading and in connection with it.

Rectal Examination.—This method of examination is repugnant alike to the physician and the patient. I cannot, as some do, consider it necessary as a routine measure. The information to be thus obtained in regard to the uterus and its adnexa is of limited nature, and never so thorough as that yielded by careful bimanual examination where the conditions are favorable. Except, therefore, where the rational history suggests rectal disease, or where the bimanual is for one or another reason incomplete or unsatisfactory, I would limit this examination in general to cases where congenital or acquired imperfections or obstructions of the genital canal forbid the methods of examination already detailed, and to virgins in order to acquire information which might justify us in rupturing the hymen for purposes of more exact diagnosis. Although, however, I restrict the necessity of a rectal examination within these general limitations, I would note here that not infrequently obscure symptoms, not explainable from the side of the uterus and its adjuncts, will be found to depend on such, in appearance, insignificant lesions as small rectal ulcer or anal fissure, even though these symptoms do not, in the least, suggest the likelihood of rectal disorder. In order to properly make a rectal examination it is essential that the rectum should have been evacuated beforehand. It will hence be often necessary to postpone such an examination until the patient's second visit, that she may prepare herself for it by an enema. The index finger, gently insinuated through the sphincter ani, will readily detect any foreign growth or stricture of the canal, and if the uterus be in fair position the cervix may be felt pressing against the posterior vaginal wall. The posterior limits of Douglas's cul-de-sac may be investigated, as well as its contents. Now, by resorting to abdomino-rectal examination the pelvic organs are depressed nearer to the rectal finger, and the posterior surface of the uterus may be palpated, as well as frequently the ovaries in normal position, and exceptionally the broad ligaments.

This last condition may be better satisfied by resorting to vagino-rectal examination, whereby a double tenaculum fixed in the cervix causes an artificial prolapse of the uterus, and thus approximates its lateral surfaces with the ligaments to the rectal finger. With the finger in the rectum an excellent opportunity is also offered for investigating the integrity of the perineal body, to be accomplished either through inserting the thumb of the same hand into the vagina, or else, as is less awkward, the index of the other hand.

A further conjoined method of rectal examination, the vesico-rectal, is of special utility in those cases where there is possible absence of the uterus, and where inversion of this organ needs to be carefully differentiated. Here it is better practice to introduce a sound within the bladder rather than the finger, for thus we obtain as exact information without risking injury to the urethra or vesical neck. We may also palpate the anterior surface of the uterus by means of the finger in the bladder, although the vagino-abdominal method, assisted, if need be, by an anæsthetic, is much to be preferred. Finally, I would allude here to Simon's method of rectal examination by means of the entire hand. This method has never become popular, and I question if to-day it is considered a justifiable procedure from a gynecological standpoint. The method requires anæsthesia, and, unless the examiner's hand be smaller than the average, the injury done to the patient is likely to be greater than any possible good which might result from the information thus obtained. I believe that through the methods of examination which I have already described a diagnosis may be reached, if one is at all possible, without resorting to Simon's procedure, and I therefore simply mention rectal exploration by the entire hand in order to condemn it.

I have now noted in succession the various methods of digital examination appropriate to the dorsal position, and have stated the general information to be thence derived. In the natural order of examination there are instrumental means of diagnosis which will be resorted to in this position before the patient assumes the left-lateral. I therefore deem it better to describe them here, rather than in connection with the description of more special instrumental measures.

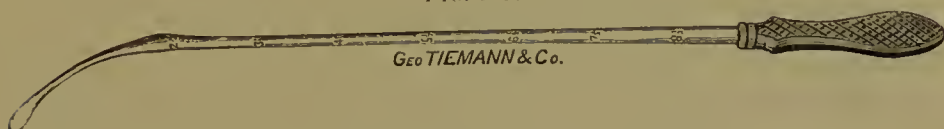
The instruments of particular utility in the dorsal position are—1, the sound; 2, cylindrical and pluri-valve specula.

The Sound.—The best form of this instrument is that devised by Simpson. It is sufficiently flexible to allow of its being bent by the hand to any desired curve, and yet not so much so as to bend on itself when it comes in contact with a foreign body or is insinuated into a fold of the cervical mucus membrane. The guiding hand is therefore ever conscious of the location of the point of the sound. A further advantage is the knob marking the depth of the normal uterus, whereby the finger, along which the instrument should be passed, is

constantly informed of the progress the sound is making. The thickness of this instrument is only a disadvantage in those cases where there exists sharp flexion or congenital or acquired stenosis of the cervical canal, under which conditions, as will be noted in its proper place, the probe is to be used.

The judicious use of the sound may reveal very important information. Its injudicious use may result in serious damage to the patient. The contraindications should therefore ever be borne in mind, and these are two in number—pregnancy, peritoneal or cellular inflammation. These conditions having been strictly eliminated, the sound,

FIG. 115.



Simpson's Sound, graduated.

used with care, can scarcely inflict damage. Whilst I cannot go so far as to say that no diagnosis is complete unless the sound has been used, I advise its systematic employment in every case where no contraindication exists. The instrument may, of course, be introduced with the patient in the semi-prone as well as in the dorsal position. This is largely a matter of individual choice or of habit. Personally, I favor the introduction in the dorsal position, because just previous to its use we may ordinarily assure ourselves bimanually of the position of the uterus, and are therefore better able to formulate the curve which the instrument must have and the direction it will have to take. The sound, then, held lightly between the forefinger and the thumb of the right hand, is to be introduced along the index of the left hand as a guide until it reaches the external os; passing through this along the canal to the internal os, the handle is to be depressed, elevated, or rotated according to the probable site of the fundus as deduced from the bimanual. If during its progress the point catches in a fold of the mucous membrane, the instrument is to be withdrawn and again introduced. Absolutely no force is to be used, the instrument being allowed, as it were, to find its own way. The information to be derived from the use of the sound is—the patency and size of the external os and of the cervical canal, and the state as regards smoothness or roughness of its lining membrane; the sensitiveness and the patency of the internal os; the degree of flexion; the depth of the uterus; the sensitiveness of the endometrium; the exact position of the fundus; and the general direction of the uterine axis. It is evident, therefore, that, aside from giving us information which is otherwise not obtainable, the sound will verify much which the bimanual

has taught us, and also, where the bimanual has been impossible or unsatisfactory, supplies the facts which we would otherwise lack. The value of the instrument for purposes of differential diagnosis is also apparent; as, for instance, where the bimanual has revealed a tumor in front of or behind the uterus the sound will tell us which is the corpus uteri and which the tumor. As for the use of this instrument as a uterine redressor or to test the mobility of the uterus, I most unqualifiedly condemn it. I know that in skilful hands it may be made to subserve these purposes without necessarily inflicting injury; but, knowing also that damage may be done through the purchase which the instrument necessarily takes at the fundus, I reject the sound and uniformly use one of the special instruments constructed as redressors, and which take their *point d'appui* at the external os. It will be noticed that I have not referred to the introduction of the sound through the cylindrical or the plurivalve specula. I do not favor such a procedure, because I know that the careful introduction of the instrument is best assured when the finger in the vagina acts as a guide, and also because there are positions of the uterus where these specula seriously interfere with the passage of the instrument, occasionally prevent it entirely.

The Cylindrical and Plurivalve Specula.—The uses of the speculum in the dorsal position are very limited. Indeed, I question if gynecology would ever have obtained the rank it holds had not the genius of Sims rendered evident the immense advantage offered by the specular examination made in the position ordinarily known by his name, and which I shall describe farther on. And the truth of this assertion is borne out by the fact that skill in the diagnosis and in the treatment of uterine disease, properly so called, is most marked in those countries where the dorsal position is made to subserve the purposes of the digital examination, and the left-lateral the specular. Through both the cylindrical and the plurivalve specula the field of vision is limited, the play of whatever instrument is necessary for diagnosis and treatment is narrowed and often negatived, and certain lesions of the cervix may be effaced or obscured which it is of paramount importance to detect. I need only instance the fact that laceration of the cervix is mistaken for ulceration by those examiners who habitually use these specula and the dorsal position. Hence, personally, I recommend the use of the speculum in the dorsal position solely for the purpose of making applications to the vagina or external os. For purposes of diagnosis I do not favor it at all, because the limited information thus obtainable may be secured to better advantage in the lateral position, and, at the same time, facts may be ascertained and treatment be employed which cannot be in the dorsal position. I would note here, however, that occasionally, as where the rational history suggests abnor-

dant leucorrhœa, it is advisable to introduce the speculum before the finger, and then the cylindrical speculum will suffice to show us the source of the discharge.

Cylindrical specula are constructed preferably of glass or hard rubber. The Fergusson may be taken as a type, and is to be obtained in

FIG. 116.

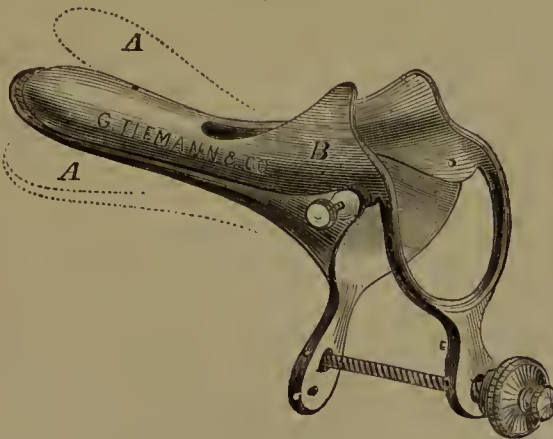


Fergusson's Speculum.

nests of various sizes. This speculum is readily introduced, previously anointed with oil or soap, by depressing the perineum with its point and gently insinuating it up to the cervix. If the vaginal walls be not specially lax, and if the cervix be in fair position, there is but little difficulty in engaging the external os in the field of vision. Oftener than not, however, the speculum must be withdrawn and reintroduced a number of times before this can be accomplished, and where the cervix lies far backward it requires considerable ingenuity and patience to see it at all.

Valvular specula are constructed of either two, three, or four blades.

FIG. 117.

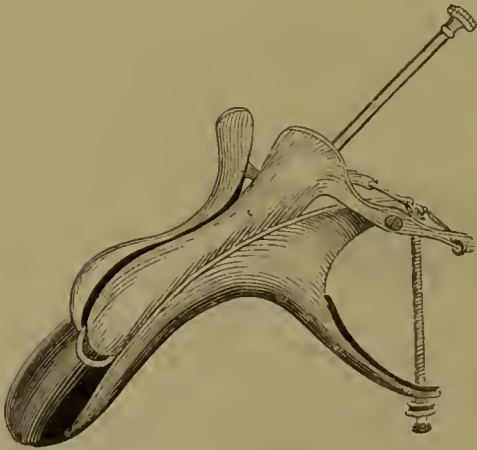


Brewer's Speculum.

Many have been invented, and each doubtless remains in favor with its inventor, although, for reasons already sufficiently stated, they are one and all inadequate for purposes of accurate diagnosis and treatment according to the requirements of modern gynecology. It is out of the question to attempt a description of the many forms here. I content

myself with mentioning, as typical of the bivalve, Brewer's speculum; of the trivalve, Notts's; of the quadrivalve, Meadows's. These specula are introduced closed and afterward expanded, and may be used in the lateral as well as in the dorsal position. It is safe to say, however, that the gynecologist who has once accustomed himself to Sims's speculum will never desert it for any form of plurivalve; and it is equally true that the general practitioner, desirous of doing something more for his patients than applying the time-honored, but to-day almost neglected, stick of lunar

FIG. 118.



Notts's Speculum.

caustic to the cervix, must learn how to use Sims's speculum and the left-lateral position. And therefore it is why I do not deem it necessary to spend time and waste space on a description of the many forms of multivalve specula and their manner of introduction. A science should be practised correctly or not at all, and surely no gynecologist will to-day claim that he is able, through any form of multivalve whatever, to accomplish what he can through a Sims. And, whilst my remarks here are limited to diagnosis, how much more forcible do they become when applied to the treatment of intra-uterine disease! Both exact methods of diagnosis and correct methods of treatment are only possible to a limited degree through tubular and plurivalve specula. Aside from the exceptions already noted (applications to the vagina and cervix), I see no further use for these instruments, and believe that the time has come when they should be weeded out of the already too cumbersome gynecological armamentarium; and my belief is the firmer because of the fact, to be noted farther on, that the oft-repeated objections to Sims's speculum are really not tenable.

Since the points to be noted through the speculum appear to better advantage through Sims's than any other, their description is deferred for a time, and it remains now to consider the final diagnostic measures which properly belong to the dorsal position.

EXAMINATION OF THE ABDOMEN: *Inspection, Mensuration, Auscultation, Percussion, Palpation.*—In inspection of the abdomen we are to look for the whitish lines, *lineæ albicantes*, the result of the rupture of muscular fibrils and evidence of distension of the abdominal walls; we are to note the shape, whether flat on the surface and bulging in the flanks, whether round or spherical, suggesting in turn ascites,

ovarian cyst, or gravidity; we are to seek movements of the surface, suggesting arterial pulsation, foetal motion, passage of flatus through the intestines; projection at any one portion, suggesting hernia, fibroids. These are possibilities which either our previous examination or that which is to follow will verify.

Mensuration is more particularly of service to the obstetrician. Still, in connection with the growth of abdominal tumors the gynecologist must frequently have recourse to this measure. The measurements of greatest service are those taken at the level of the umbilicus and from the ensiform cartilage to the pubes. We are thus kept informed as to the rate of growth of tumors, and may satisfactorily check their diminution under treatment or at the approach of the menopause.

Auscultation and percussion are similarly—especially the former—of greater utility from an obstetrical than from a gynecological standpoint. Not uncommonly, however, the gynecologist is called upon to make a differential diagnosis of pregnancy in its later stages, and then, obviously, the obtaining of the foetal heart through auscultation is of essential importance. Succussion, or the splashing of fluid in the abdomen on change of position of the patient, is thus also obtainable, as well as the bruits suggestive of change in the blood-vessels or pressure upon them. Percussion is one of our most valuable means of obtaining information in regard to the nature of abdominal enlargements. The uniform and general tympanitic note, characteristic of gaseous distension of the intestines; the dull note in the flanks and tympanitic in the epigastrium, suggestive of ascites; the local dulness accompanying local tumor or distended bladder; the shading off of the dull into the tympanitic, or *vice versa*, suggestive of tumor growing from above, or the reverse; the sense of resistance to the percussed finger, suggestive of either fluid, semi-fluid, or solid contents,—such, in outline, are the points obtainable through percussio.

Palpation of the abdomen, as already stated, is not necessary as a routine measure in gynecological practice; but when the history, appearance, or digital examination renders probable the presence of abdominal enlargement, then this measure must be resorted to; and it is essential that the patient should be properly prepared for the necessary manipulation, and that the examiner should proceed systematically and with gentleness. The bladder having been emptied, the clothing loosened, and the abdomen exposed, the examiner stands on the patient's right, and, encouraging her to relax the abdominal muscles, depresses with the tips of his fingers, gently but firmly, the various regions of the abdomen. Where, from excess of adipose development or hyperæsthesia of the abdominal walls, manipulation is impossible or unsatisfactory, then, should the necessity of palpation be obvious, recourse must be had to anæsthesia, when a tumor, otherwise undis-

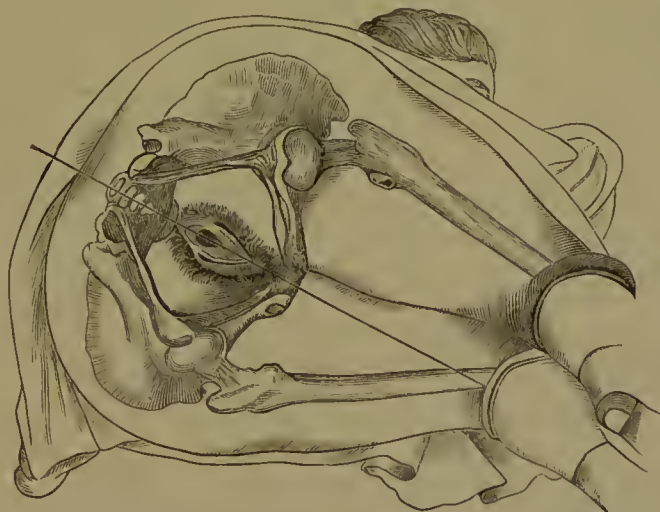
coverable, may be revealed, or else one manifest, but of uncertain nature, may disappear (so-called phantom tumor). The facts to be learned from palpation may be summarized: The probable abdominal or pelvic origin of a tumor; the density and general outline of such tumor; its single or multiple nature; its fixation or mobility; its size and depth below the surface; its probable connection with other organs; the presence of fluid, general or localized, in the abdominal cavity. Thus, then, we differentiate between abdominal and pelvic tumors proper, or simple enlargement of abdominal organs; thus we recognize a movable kidney, a multi- or unilocular ovarian cyst, subperitoneal fibroids, the gravid uterus, the uterus enlarged by cyst or new growth of solid or semi-solid nature, abscesses within the abdominal walls, hernia, aneurism: indeed, in a favorable case, the skilled examiner may often so thoroughly palpate as to be assured in turn of the probable gross condition of every one of the important abdominal organs. It is out of place to do more than refer here to the value of abdominal palpation to the obstetrician in determining the position of the fetus within the uterus, the existence of multiple gestation, etc.

THE LEFT-LATERAL POSITION.—Thoroughness and ease of examination in this position will depend on its being properly and exactly assumed. The position aims at bringing the force of gravity to bear on the abdominal and pelvic organs, whereby they are caused to sink downward and upward, thus tending to produce a vacuum in the vagina, which the external air, on separating the labia, rushes in to satisfy, and thereby balloons out the vagina and the vaginal vault. To obtain these conditions at their maximum the thorax must be the lowest point and the sacrum the highest when the patient is lying in this position. Even as in the dorsal position, and still more essential, the patient's clothing must be loosened from around the waist and compression of the chest-walls by the corset removed. The steps by which this position may be assumed are as follows: The patient, resting on her left natis at the edge of the examining-table to the left of the mid line, places her left arm behind her and lies down diagonally across the table, the left cheek on the pillow and the left thoracic wall against the mattress. She has thus rolled over on her chest, and the lowest point of our position has been obtained. Next, the thighs are flexed on the trunk, the right more than the left, so that the right knee projects considerably over the left, and the legs are placed at a right angle to the thighs. The pelvis has now been elevated, and the sacrum is the highest point of the position. During this manœuvre the nates are often pushed too far up on the table, so that, as a further step, it is necessary to draw them well down to the edge. The hands may now grasp the lateral edges of the table, and the patient is in position. She should be covered by a sheet, which is tucked around the superior (right) leg and thigh, the

left leg and thigh being covered by a towel, the vulva, perineum, and anus alone remaining exposed. The table should be so placed that the light may strike slantingly, from before backward, on these parts. If the table have the lateral inclination referred to in the remarks on this subject, it is obvious that the force of gravity may still further be called into play by utilizing it. This inclination, however, whilst a decided advantage if the examiner have no assistant, is not indispensable.

Before proceeding to a description of the methods of examination in the left-lateral position, it seems proper to consider very briefly the objections to this position advanced, in particular, by our transatlantic

FIG. 119.



The Left-lateral Position (after Mundé, from Hegar and Kalténbach.)

brethren. These objections are three in number: 1. There is greater exposure of the patient than in the dorsal position. 2. The change to this position from the dorsal requires extra time and trouble. 3. The use of the left-lateral position necessitates the presence of an assistant. The first objection is not founded on fact, and, even though it were true, the patient would not object to greater exposure if assured that at the same time she receives greater benefit. The truth is, that in the left-lateral position, the patient being properly arranged, the vulva, perineum, and anus are alone exposed, and these parts it is essential to expose also in the dorsal position in order to introduce a tubular or valvular speculum. The second objection—to grant for a moment that it is worthy of serious consideration—falls to the ground in the face of the assertion, not to be denied to-day, that the extra trouble simply leads to correct diagnosis and effective treatment. The third objection is, in a measure, valid. It is simply a wise precaution for the physician, when able, to have a trained assistant present to assist him

in arranging his patient and to hold the speculum. The presence of a nurse is a safeguard against blackmail, and equally so whether the patient be examined in the dorsal or the left-lateral position. It is a great convenience, too, to have some one at hand to hold the Sims's speculum, but where the amount of practice or the means of the physician do not necessitate or allow the constant presence of the trained nurse, I can affirm that he may intelligently and correctly use this instrument alone, if he but possess one of the modified forms which will be described farther on. I believe, indeed, that the above objections to Sims's instrument and position are simply, in part, the outcome of ignorance as to use and benefits obtainable—in part of unwillingness to change from routine and time-honored methods.

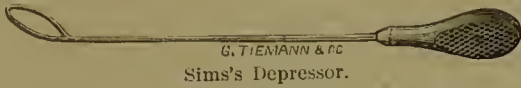
Digital Examination in the Left-lateral Position.—For diagnosis by means of the finger this position presents no advantages over the dorsal; indeed, it is decidedly inferior, seeing that the inner organs have gravitated away from the outer. For the same reason the bimanual cannot be performed satisfactorily in this position, aside from the awkwardness of the attempt. The external genitals may, of course, be inspected nearly as well as in the dorsal position, the integrity of the perineum be tested, and as for the anal region, it may be more closely examined. It is in this position that the rectum may be everted by means of a finger in the vagina, and a fissure or ulcer readily brought to view. Frequently, by means of one or two fingers, Douglas's cul-de-sac may be more carefully explored than in the dorsal position, and the nature of a post-uterine tumor better appreciated. The extent, also, to which posterior adhesions limit the mobility of the uterus may be more correctly determined, and the backward displaced uterus more effectually elevated by the finger in the lateral position. Barring these exceptions, the chief utility of this position, as intended by Sims, its originator, is the exposure of the vaginal vault by means of the speculum he devised, and which has made much of modern gynecology a possibility.

Specular Examination in the Left-lateral Position.—There is but one speculum of use in the lateral position, and this is the duckbill or Sims's. The cylindrical speculum, the various bivalves and multivalves, may, of course, be inserted into the vagina, but the disadvantages are the same as, and the advantages no greater than, have already been noted under the dorsal position. What we need in the lateral position is a perineal retractor and an instrument for depressing the anterior vaginal wall. These purposes Sims's duckbill speculum and his depressor subserve perfectly.

The chief bar to the general use of the unmodified duckbill is the fact that an assistant to hold it is practically a necessity when it is desired to introduce instruments into, or to make applications to, the uterine cavity. It is possible to perform these manipulations

alone, exceptionally, if the examining-table have the lateral inclination, the uterus be in fair position, and the vaginal walls not markedly relaxed; for under such favorable circumstances the anterior vaginal wall will gravitate upward, the depressor may be dispensed with, and

FIG. 120.



Sims's Depressor.

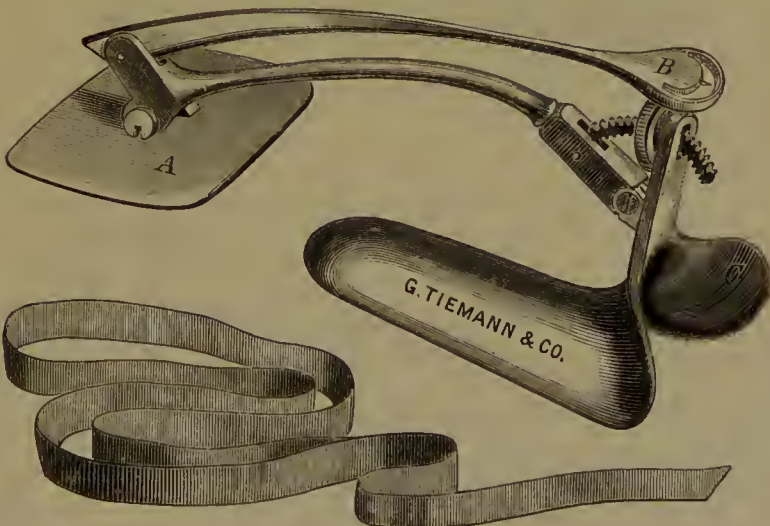
FIG. 121.



Sims's Speculum.

the examiner's right hand is thus left free to manipulate as he pleases. As a rule, however, if the examiner be alone, both his hands are occupied, the one with the speculum and the other with the depressor, so that he can accomplish nothing beyond getting a view of the cervix. And therefore it is that Sims's original instrument has been so variously modified, usually in order to make it self-retaining. When we consider how indispensable Sims's speculum is for both diagnostic and therapeutic purposes, and therefore how essential it is that the general practitioner, the exigencies of whose practice do not require the constant attendance of a nurse, should be able to scientifically use this instrument when using it

FIG. 122.



Hunter-Erich Speculum.

at all, we are not slow to accord a word of praise to each gentleman who has aimed at modification, even though of all the various forms there is scarcely one which is not open to objection, largely on the score

of complexity. Without any desire to be invidious I shall refer here to only two modified Sims's which may be used to advantage without the assistance of a nurse. The one is Hunter's modified Erich, with which, although I am not personally familiar, I am assured by many gentlemen any desired manipulation is possible. It is in appearance rather complicated, but after a certain amount of practice much time is not required for adjustment. It is not possible to give a clear description of this instrument in words, and I content myself with figuring it. Another modified form of Sims's speculum, which from extensive personal experience I can recommend, is that devised by Thomas, essentially modified by M. D. Mann, and recently altered in certain respects by myself. The original instrument had a sacral-piece attached to it, and was more complicated than the later models. Mann dispensed with this piece, and at the same time had the blade and depressor lengthened and broadened. The instrument then consisted of a Sims's blade with attached depressor, this latter so articulated to the blade as *not to interfere in any way with the field of vision nor with instrumental manipulation, and—a most important point—so as not to distend in the least the ostium vaginæ*. Further, a hook (Fig.

FIG. 123.



1. Mann's Speculum.

2. Tenaculum for Mann's Speculum.

123, A) was placed on the depressor-shaft to which the tenaculum, used to draw down or steady the uterus, might be attached. This instrument is shorn of the objections common to other modified Sims's. I have recently had the instrument altered by adapting the depressor to the lower surface of the blade, fitting a flange, to hold up the superior buttock, to the upper surface of the blade, and by shortening the depressor bar. This instrument may be held by the left hand, or else, when the depressor handle has been screwed down and the handle

of the instrument removed, we have a *self-retaining* speculum, and both hands are free. I have tested this instrument faithfully, and am able with it to perform, in Sims's position, unassisted, any manipulation (applications to endometrium, curetting, etc.) proper to office practice.

Other forms of specula devised as self-retaining are those of Emmet and of Studley and Darrow. These are, however, complicated, and are apt to alarm the patient by the time and manipulation necessary for their adjustment. I believe that either through the Hunter-Erich or through Mann's speculum, or its modification, the general practitioner will be able, without an assistant, to make a correct diagnosis and apply the requisite treatment; and that there is, therefore, no longer any excuse for the halfway measures commonly, particularly in Europe, resorted to through the cylindrical or multivalve instruments.

Introduction of Sims's Speculum.—This instrument may be introduced either along the index finger of the right hand as a guide, or

FIG. 124.



Mundé's Flange Speculum.

else independently of a guiding finger. I much prefer the latter method, mainly because thereby soiling of the finger is avoided. The speculum is readily inserted as follows: The examiner, sitting on a stool or chair a little to the left of his patient, separates the labia with the thumb and index of the left hand, and, holding the speculum, previously lubricated, between the fingers of his right hand, inserts the point of the blade into the vulvar cleft and pushes the blade along the posterior vaginal wall. If care be taken to keep the blade pointing backward toward the coccyx, it will necessarily seek the posterior cul-de-sac and lie behind the cervix. The speculum is now to be transferred to the left hand and the perineum retracted with an upward inclination. The right hand, by means of the depressor, pushes down the anterior vaginal wall, the cervix ordinarily comes into view, and the speculum is handed to the nurse, if one be present, who holds it in

position with her right hand, whilst her left pulls up the superior buttock. This last step is rendered unnecessary if the speculum have adapted to it the flange devised by Mundé for keeping the right buttock out of the field of vision—a modification which will be found particularly of use when the nurse is desired to hold some other instrument for the examiner, and can do so in her left hand. Exceptionally, in pluriparæ with loose and flabby vaginal walls, or when from anterior displacement or distortion of the uterus the cervix lies far back in Douglas's cul-de-sac, it is impossible to obtain a satisfactory view of this organ without resorting to a further instrument, the tenaculum.

FIG. 125.



Emmet's Tenaculum.

By hooking this into the anterior lip of the cervix and making gentle traction the cervix may be brought into view. The traction must be

FIG. 126.



Sims's Tenaculum.

gentle, especially if, as a result of our bimanual examination, we have obtained evidence of, or have reason to suspect, recent or chronic cellulitis or pelvic peritonitis.

The speculum in position, we are now able to note the appearances of the cervix.

The Appearances of the Cervix through Sims's Speculum.—The chief cervical appearances to be noted are the color, shape, condition of the external os, and the discharge issuing from it. The *color* of the cervix varies from light-pink, the normal, to blue or violet, a sign of congestion and suggestive of pregnancy, subinvolution, ovaritis, mechanical interference with the pelvic circulatory system. The *shape*, unaffected by disease, may be roundish, conical, or flattened. The site of the external os, in the centre or to one side, its size, pinhole (a frequent explanation of sterility), patent to the finger (suggestive of recent miscarriage, disease of the endometrium or endocervix), fissured or lacerated (evidence of childbearing), are further points to be noted. The distinction between an erosion, ulceration, and laceration may now be readily made without the source of error referred to under the subject of multivalve specula. The eroded, everted mucous membrane of a lacerated cervix may be rolled in by tenacula, and the superficial denudation of epithelium accompanying a catarrhal erosion is clearly,

at a glance, different from the excavation the result of ulceration. The color and the nature of the discharge issuing from the external os give us an inkling of the probable main source, points already referred to under the head of the digital examination. The reaction of this discharge may be tested, and if acid will offer a valid explanation of the cause of sterility.

Introduction of the Probe.—Where, owing to narrow external os or cervical canal, or to sharp flexion, it was found impossible to pass the sound in the dorsal position, the probe—a miniature flexible sound—may now be used. It goes without saying that previous to the attempt to pass this instrument the position of the uterus has, where possible,

FIG. 127.



Emmet's Flexible Probe.

been ascertained bimanually, and that the absence of the contraindicating factors already referred to has been determined. The probe is to be bent according to the direction it will probably have to take in order to reach the fundus, and the depth of the canal may be measured and its sensitiveness ascertained, even as noted when speaking of the sound.

It is not in place to describe here the further uses of Sims's position and speculum, such as for the efficient tamponade of the vagina and the making of applications to the uterine cavity. The value of this position and speculum for the use of special instrumental diagnostic means will be noted farther on.

THE GENU-PECTORAL POSITION.—For purposes of diagnosis this position is of little value; and fortunately so, because it is a difficult position for the patient to retain for any length of time, and one particularly offensive to her modesty. Its chief uses, and very important ones, are for the thorough tamponade of the vaginal vault, and for the reposition of a displaced uterus which defies our efforts in the left-lateral position. To assume it, the patient kneels at the edge of the table and leans forward, so that her chest-wall, not her elbows, shall rest on the mattress. Obviously, gravity may now act to the greatest possible advantage, so that, when on lifting the perineum with Sims's speculum the vagina is opened and the pneumatic pressure of the air is superadded, the pelvic organs, unless pathological alterations interfere, sink upward and downward beyond the efficient reach of the examining finger. It is in this position that the length of the infra-

vaginal portion of the cervix may be accurately determined; but with this exception and the therapeutic measures noted above, the genu-pectoral position fulfils no purpose which the left-lateral may not to better advantage.

THE ERECT POSITION.—Examination in this position is attained by the patient, with legs separated, standing in front of the examiner, whilst he rests on one knee or sits, and, introducing the hand under the clothing, carries the index finger along the perineum into the vagina. For diagnosis this position is rarely available, for under usual conditions the uterus lies more horizontally, and the cervix, hence, is far back out of easy reach of the finger. In this position, however, we may determine the effect of intra-abdominal pressure on the pelvic organs, and detect downward sagging of the uterus which was not appreciable in the dorsal position, thereby finding an explanation for backache or bearing-down sensations otherwise of obscure origin.

SPECIAL INSTRUMENTAL OR EXPLORATORY MEANS OF DIAGNOSIS.

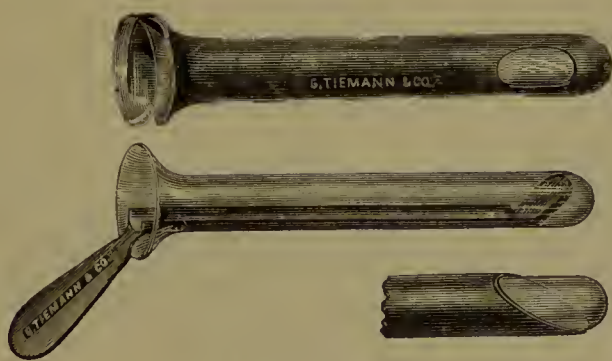
Having now considered the general and routine measures of use in the diagnosis of disease of the female generative organs, I proceed to a description of those special means, recourse to any one of which may be necessary in order to complete our diagnosis. I shall consider these measures under the following subdivisions:

- A. Instrumental examination of the urethra, bladder, and rectum;
- B. Dilatation of the cervix for diagnostic purposes;
- C. Curetting of the cervix and uterus for diagnosis;
- D. Artificial prolapse of the uterus for diagnosis;
- E. Aspiration through the vagina or abdomen for diagnosis.

A. INSTRUMENTAL EXAMINATION OF THE URETHRA, BLADDER, AND RECTUM.—The instruments at our disposal for examination of the urethra and bladder are few in number, and, owing to the limited expansibility of the meatus and urethra, the ocular evidence of disease obtainable is at best unsatisfactory. The use of the finger for purposes of exploration I must consider unjustifiable unless there is strong prospect of sufficiently relieving our patient to atone for the not impossible laceration. Ordinarily, by means of the sound—the uterine will generally suffice—we may detect the same pathological conditions as the finger could, and yet we thereby subject our patient to no risk of injury. In addition to the sound, the speculum and the endoscope are the instruments available for diagnosis, and they are best introduced with the patient in the dorsal position. The sound will determine the sensitiveness of the urethra and bladder, the smoothness or roughness of the mucous membrane, the presence of stone or of large foreign growths. Sensitiveness, varying in degree, will suggest caruncles, fissure, or

cystitis. Examination of the urine will differentiate the latter, and recourse to inspection, the former. The urethral speculum is constructed either of glass, tubular in form, or of metal, with divergent branches. Through such specula the color and integrity of the urethral mucous membrane may be noted, caruncles detected, and, exceptionally, a fissure at the vesical neck. Reflected light will greatly assist in such an examination. In the absence of a speculum the ordinary dressing-forceps or a steel-branched uterine dilator will allow us to inspect the urethral mucous membrane. As typical of the endoscope, I instance that of Dr. Skene of Brooklyn, although, except in his hands, it has not become widely used. It consists of two portions—a

FIG. 128.



Skene's Endoscope.

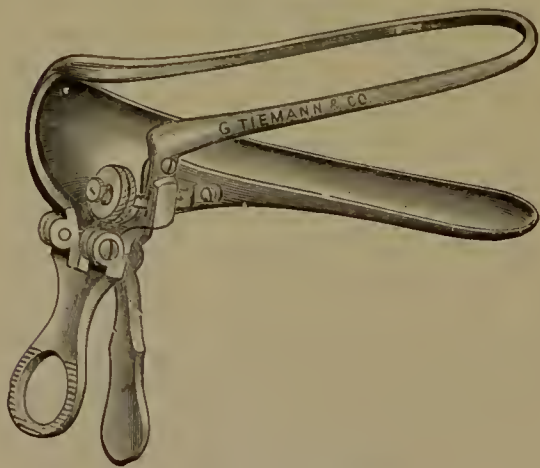
glass tube and a blackened section of a cylinder containing a mirror placed at an acute angle at its distal extremity. The glass tube fits into the cylindrical section; the mirror, attached to a handle, lies in the glass tube; and when the cylinder has been introduced into the urethra light reflected from a head-mirror upon the mirror in the tube illuminates the urethral mucous membrane, and the trained eye may detect alterations within the urethra. Beyond this, whether speculum or endoscope be used, inspection extends to an unsatisfactory degree, owing to the difficulty of illuminating the cavity of an organ the walls of which constantly tend to approximate except when distended by fluid or disease. Fortunately, diseased conditions of the bladder may ordinarily be diagnosticated by means of the sound and associated examination of the urine, and therefore, from a diagnostic standpoint, it rarely becomes necessary to resort to either the speculum or the endoscope. It is in place here to refer to the possibility of sounding the ureters, and of occluding one or the other by the finger, in order to detect disease of the urinary tract above the bladder, and limited possibly to one ureter or kidney. Such manoeuvres are yet in their infancy, and, whatever the possibilities for the future, up to the present have yielded no results of a practical nature.

I will simply refer here to a surgical method of diagnosis which has yielded excellent results in the hands of the originator, Dr. Emmet, and which is possibly destined to take the lead of all other methods of diagnosing disease of the bladder and its neck. This method consists in buttonholing the urethra, and the procedure will be described in connection with the special diseases of the urinary tract.

The necessity of careful rectal exploration, in every case where the symptoms are otherwise unsatisfactorily explained, has already been insisted upon. Specular examination of the rectum as a routine measure is not necessary, but it should never be neglected in any case where there exists a suspicion of disease of the upper rectum. This examination is painful, ordinarily requires previous distension of the sphincter; and it is necessary, therefore, to resort to anæsthesia. The advisability of a thorough cleansing of the lower bowel by purgative or enema, before resorting to rectal examination, is sufficiently apparent. The general indications for a specular rectal examination are complaint of pain before, during, or after defecation and the presence of blood, pus, or membrane in the dejections, provided the sigus find no explanation in the digital eversion of the rectal mucous membrane already referred to, and in the absence of such an obvious, although not always sufficient, cause as hemorrhoids. The specula of utility are either tubular or valvular. For general purposes the blade of a small Sims's will suffice for diagnosis, although a much more convenient instrument, when the examiner is without an assistant, is that devised by Kelsey

of New York. The special advantage of this instrument is the fact that a large surface of the rectal mucous membrane may be inspected through it without the anus being stretched to any great degree. Whatever the form of instrument used, either reflected light, or that from one or another of the portable electric light apparatuses recently devised, is almost a necessity for exact diagnosis. The patient

FIG. 129.



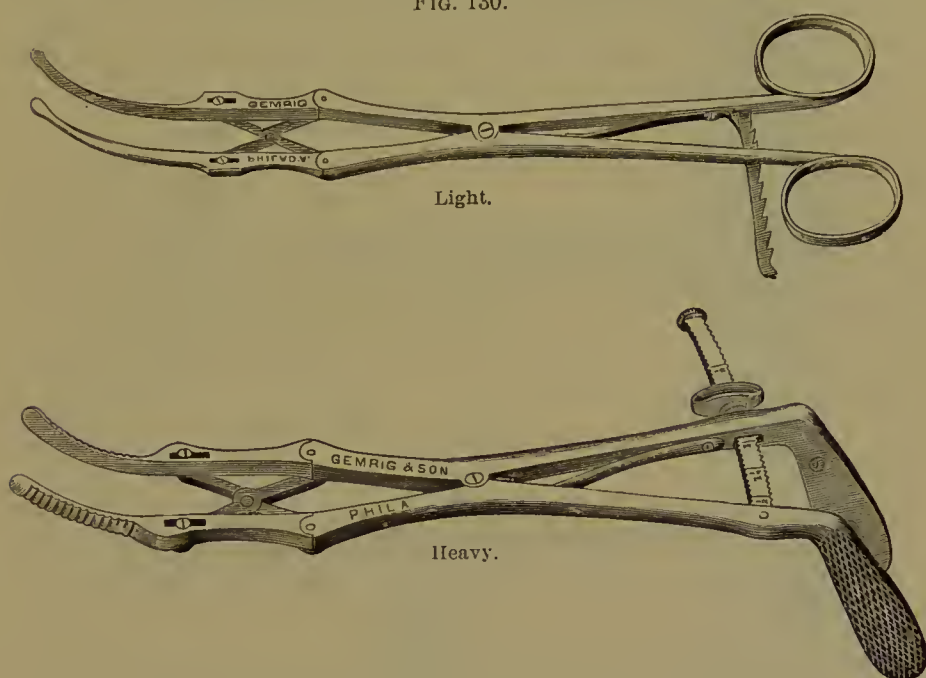
Kelsey's Rectal Speculum.

may occupy either the dorsal or the left-lateral position, although a better view may be obtained from the latter. The points to be noted through the speculum, some of which must escape the examining finger alone, are—the color and integrity of the rectal mucous membrane, erosion,

ulceration and fissure, polypi, carcinoma, and fistulous openings from ischio-rectal or pelvic abscesses.

B. DILATATION OF THE CERVIX FOR DIAGNOSTIC PURPOSES.—In order to explore the interior of the uterus with the finger, the cervical canal must first, apart from the puerperal state, be widely dilated. To

FIG. 130.



Goodell-Ellinger's Dilators.

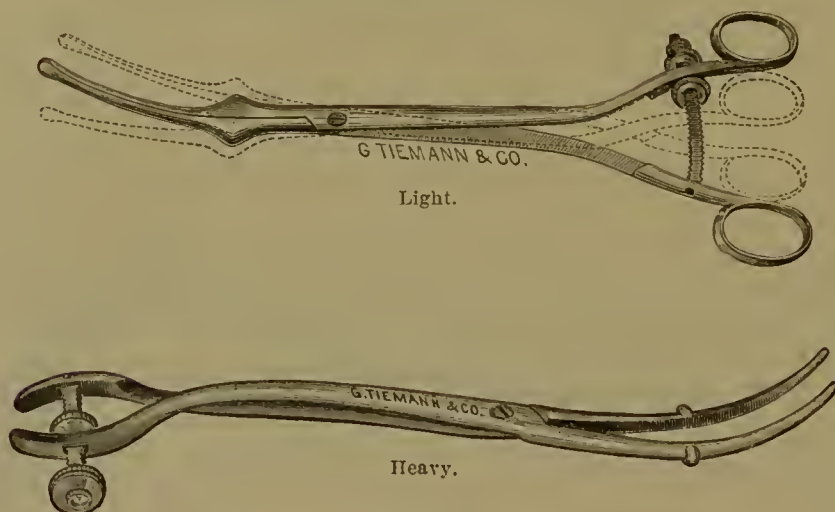
accomplish this we have at our disposal three classes of instruments: 1, steel-branched dilators and conical graduated steel or hard-rubber sounds; 2, rubber dilatable tubes; 3, tents.

The steel-branched dilators are the best agents for rapid dilatation, and will rarely fail in accomplishing their purpose, except where there exists excessive rigidity of the cervix (from hyperplasia or cicatrization). As types of these dilators I would mention that of Ellinger and that of Palmer. Ellinger's instrument is scarcely powerful enough, unless the cervix is readily dilatable, and it is also objectionable on account of the number of lodging-places for dirt it offers. Goodell of Philadelphia, however, speaks of it highly as modified by himself, and justly so, since his modification has essentially improved the instrument. He has had it constructed of two sizes—a small with slender blades, and a larger one with powerful blades which do not feather, and with a screw attachment to separate the blades. This screw-attachment is a real advantage, for thereby we are enabled to dilate slowly, allowing the muscular fibres of the cervix to yield to the applied force,

instead of rupturing them. Another excellent dilator is Palmer's. It also is furnished with a screw attachment, and it will dilate to quite one inch, sufficient to allow the average index finger to pass. The larger Goodell-Ellinger dilates to an outside width of one and a half inches.

The conical graduated sounds will accomplish dilatation as effectively as the steel-branched dilators, although they take more time, and their use has the decided disadvantage of requiring counter-pressure on the

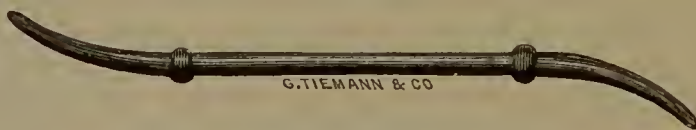
FIG. 131.



Palmer's Dilators.

fundus through the abdominal walls; and in many cases this manœuvre fails, for the simple reason that the body of the uterus is too markedly displaced backward to be reached by the external hand. However valuable these sounds, therefore, for purposes of treatment where dilatation is desired for digital exploration, I can conceive them only of use where,

FIG. 132.



Hanks's Cervical Dilator.

through the smaller sizes, sufficient preliminary dilatation is requisite to allow of the introduction of a branched dilator. These sounds have been variously constructed and modified. The most serviceable probably, certainly as good as any others, is the set devised by Hanks of New York.

The rubber tubes, or water-dilators, are also effective dilating agents, but they are slower in action than the branched dilators, and have the disadvantage, common to all rubber, of frequently proving defective at the very time when service is required. These instruments are represented by Molesworth's and Emmet's.

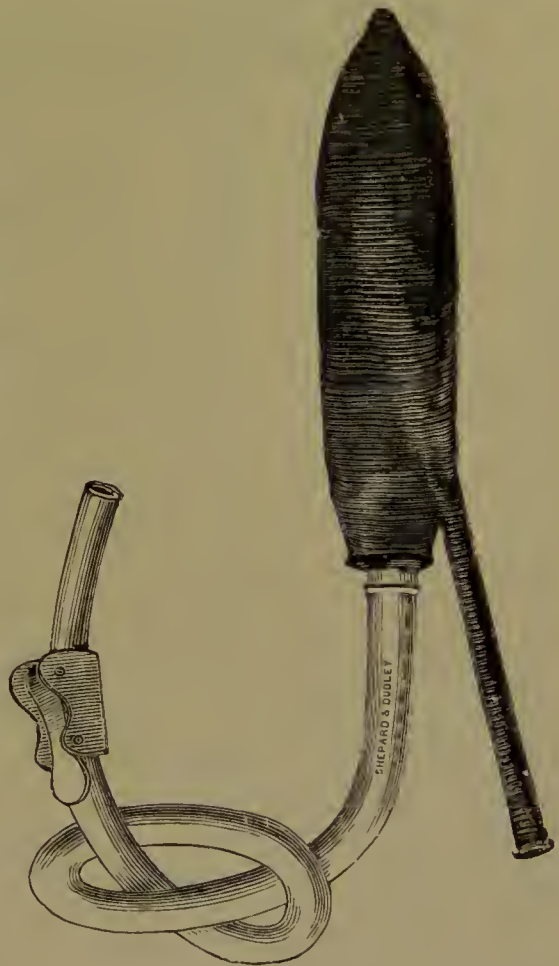
Tents are the slowest of all dilating agents, and for purely exploratory purposes they will doubtless, in general, yield to the branched dilators, except where there is a very rigid cervix to be overcome. They possess, however, certain therapeutic uses for which they must be retained. They are constructed either of compressed sponge, of laminaria, of tupelo,—these, at least, are the sole agents of value for sufficient dilatation to allow of exploration.

Sponge tents have long been in favor on account of their great and equable expansile power. The great objection to these tents is the fact that their use is liable to be followed by sepsis, notwithstanding careful antisepsis both in preparation and in introduction. For this reason, therefore, they are gradually being superseded by the tupelo for exploratory purposes.

The laminaria has but little dilating power comparatively, and this power is least effectual at the very point where dilatation is most desired—the internal os. This form of tent, therefore, may be ruled out as an agent of value for dilatation to be followed by digital exploration.

The tupelo (root of the *Nyssa aquatica*) is the agent *par excellence* in tent form for dilating purposes. Its expansibility is nearly equal to that of the sponge, it dilates equably throughout its length, it does not abrade the cervical tissues to the same extent as the sponge, it is excep-

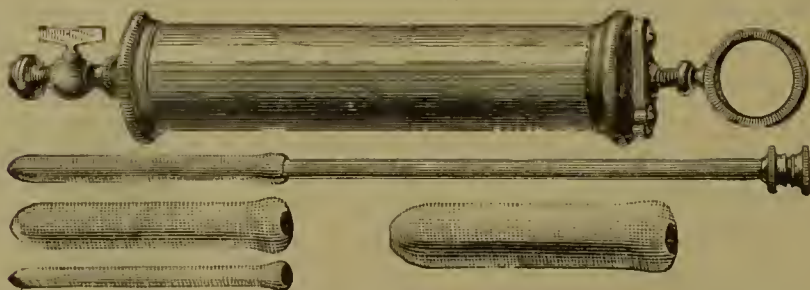
FIG. 133.



Emmet's Water-Dilator.

tional for its proper use to be followed by sepsis. The sphere of dilatability of this tent is well represented in the accompanying cut (Fig.

FIG. 134.

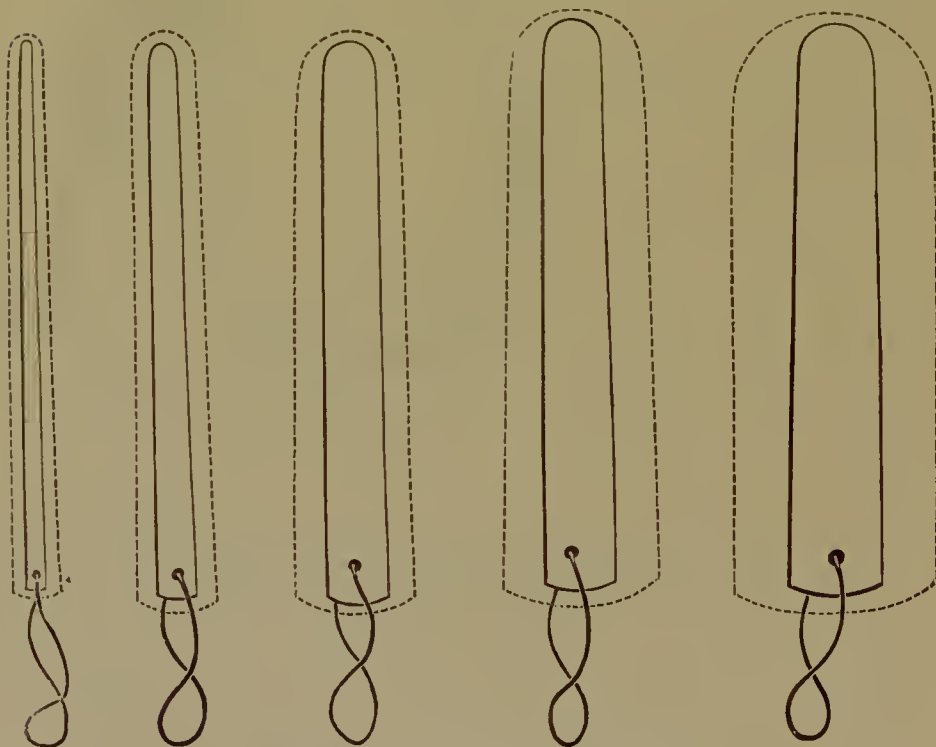


Molesworth's Hydrostatic Dilator.

135). The tupelo was introduced to the notice of the profession by Dr. Sussdorff of New York City, and may now be obtained in varying sizes and lengths, although a large one may be readily whittled to the desired size.

The indications in general, aside from therapeutic purposes, for the

FIG. 135.



Dilatability of Tupelo Tents (after Mundé).

use of dilating agents are hemorrhage from the uterus not explainable by recourse to other diagnostic means, and the necessity of ascertaining

the location and attachment of an intra-uterine growth. Dilatation sufficient for exploratory purposes should ever be considered a minor operation, requiring anæsthesia, and is to be performed at the patient's house; and after the use of any dilating agent the patient should remain in bed from twenty-four to thirty-six hours, and, as a prophylactic measure, opium should be administered and heat applied to the abdomen. In case the sponge tent is used, it is a cardinal rule not to follow the first tent immediately by another, and disregard of this rule is responsible for many a case of fatal septicæmia. The same caution is not applicable to the tupelo tent.

Ordinarily, where dilatation is desired for diagnostic purposes, the cervical canal will be sufficiently patulous to allow of the introduction of the dilating agent without previous incision of the external os. Should this be necessary, however, there is little added risk, except where a sponge tent is the dilating agent, provided due antiseptic precautions are taken before and after the operation.

From what precedes, it is apparent that I favor as dilating agents, for purposes of exploration, the steel-branched dilators where rapid dilatation is desired, and the tupelo tent in case of excessive cervical rigidity and where the slower action of the tent may be awaited. Both the dilator and the tent are best introduced through Sims's speculum, the position of the uterus having been first determined bimanually. The vagina should always first be irrigated with clean boiled water, to which carbolic acid or corrosive sublimate may be added. The size of tent suitable to the case is readily introduced by grasping it by an ordinary dressing-forceps, the cervix being steadied by a tenaculum fixed in its anterior lip. In case the Goodell-Ellinger dilator be used, the smaller size may be passed first, and dilatation by it will pave the way for the introduction of the larger size. Occasionally, independently of the puerperal state, the cervical canal may be dilated by means of the finger, and wherever possible the finger of course ranks above all other agents.

Whatever the means employed, dilatation once accomplished, the patient should lie in the dorsal position and the index finger, previously disinfected with care, is to be passed to the fundus, this in turn being depressed through the abdominal walls. We are now in a position to examine carefully the entire endometrium. Thus the finger notes the smoothness or roughness of the mucous membrane, and is able to detect the presence of any foreign body, such as a tumor and its attachment or a remnant of secundine or placenta, and we may resort at once to the necessary treatment. Our exploration ended, if no surgical procedure or application be resorted to, the uterine cavity should be thoroughly douched with hot water, plain or with the addition of some antiseptic, and in case of hemorrhage it may be swabbed

with tincture of iodine, and both the cervical cavity and the vagina tamponed.

C. THE CURETTE AS A DIAGNOSTIC AGENT.—In this instrument we possess a very valuable means of acquiring information in regard to the contents of the uterine cavity and the condition of its lining membrane. There are two varieties, the sharp and the dull. For diagnostic purposes the latter alone is of use. The former has therapeutic uses which the latter can, at times, only partially fulfil. Récamier, the inventor of the curette, had it constructed with cutting edge, and therein he was imitated by Sims in his instrument. It was reserved for Thomas to devise the dull instrument and to point out the information to be derived from its use. The dull curette is made in three sizes, has a flexible shaft allowing of bending to any desired curve, and the scraping edge is smoothly flattened so as to prevent its injuring the endometrium.

FIG. 136.



Thomas's Dull Curette.

The indication, in general, for the dull curette may be said to be uterine hemorrhage or profuse leucorrhœa which yields neither to general nor to local measures, and suggests, therefore, the presence of an intra-uterine growth or degeneration of the endometrium requiring recourse to active therapeutic measures. This instrument may be used with safety in office practice, provided the object be diagnosis. Where, as the result of its diagnostic use, disease is revealed requiring resort to the more active use of the dull or to the sharp curette, then it is advisable to defer further manipulation till the patient can be seen at her house. The contraindications to the use of this instrument are exactly the same as those which apply to any instrumental interference with the uterine cavity—suspicion of pregnancy and evidence of recent exudation around the uterine tubes. No anæsthetic is required, since the use of the curette for diagnosis is practically painless. Preliminary dilatation of the cervix is rarely requisite, because in the very cases where the curette is indicated for diagnosis the hemorrhage or leucorrhœa has softened the cervical tissues and accomplished dilatation to a sufficient degree. Where this is insufficient, however, gentle dilatation with a steel-branched dilator will allow of the passage of the smallest sized curette, which practically suffices for diagnosis alone.

The curette can only effectually be introduced through Sims's speculum, and it goes without saying that the position of the uterus should first have been determined bimanually, and the direction of its canal

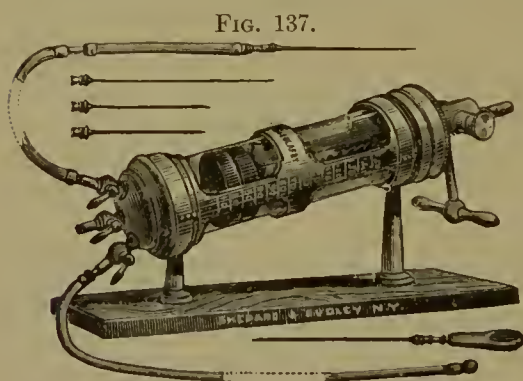
by means of the sound or probe. The introduction of the curette is facilitated by hooking a tenaculum in the anterior lip of the cervix, whereby the uterus is steadied, and by making gentle downward traction the axis, in case of flexion, is in a measure straightened out. The instrument is to be given the curve which the previous introduction of the sound or probe has proved necessary, and passed to the fundus. It is held lightly between the thumb and index, and the entire endometrium is carefully but gently scraped. The sensation communicated to the fingers of roughness or smoothness of the endometrium, of inequalities in its surface, and the grating sound often audible as the instrument passes, in particular, over the cervical mucous membrane, suggest in turn possibilities even before the débris from the curetting is examined. The gross appearance of the débris, if any, will frequently make our diagnosis; as, for instance, where numerous granulations or vegetations are removed, or where, not uncommonly, a portion of the secundines from a neglected or not suspected miscarriage is brought to light. Where there is any doubt, however, resort to the microscope may reveal the structure typical of malignant disease. In case of polypus, also, the curette, presenting a broader surface than the sound, will give us more definite information in regard to its attachment. The application of the curette with care will rarely be followed by much hemorrhage; still, the better practice is to make an after-application of iodine to the endometrium, and in cases where the uterus is enlarged and heavy to tampon both the cervix and the vagina. Prophylaxis can never harm, and may do good.

D. ARTIFICIAL PROLAPSE OF THE UTERUS FOR DIAGNOSIS.—This diagnostic means need rarely be resorted to. The manœuvre is only indicated where the bimanual examination fails to give us exact information in regard to the nature or insertion of a tumor closely related to the uterus, and also where, owing to great adipose development in the abdominal walls, the external hand cannot depress the body of the uterus sufficiently to enable the finger, exploring its cavity, to reach the fundus. I question if it be not wiser to attempt to finish our exploration under anæsthesia, for it strikes one as crude to thoroughly dislocate any organ of the body from out of its natural position. The method is rather more in favor in Europe than with us, and apparently only exceptionally is damage inflicted. The contraindication to artificial prolapse is the presence of exudation, recent or chronic, around the uterus—a factor which of itself would prevent the success of the manœuvre, even if the attempt, under the circumstances, were not to be condemned on account of the likelihood of relighting the inflammatory process.

Artificial prolapse is accomplished by hooking a strong double tenaculum or vulsellum into the cervix, and slowly making traction

until the cervix appears at the ostium vaginae. This accomplished, the finger in the rectum, or, exceptionally, in the bladder, may to better advantage palpate the posterior and anterior walls of the uterus, or the finger within the uterine cavity may more readily explore the fundus of the uterus. On releasing our hold on the cervix the uterus will return to its position.

E. ASPIRATION THROUGH THE VAGINA OR ABDOMEN FOR DIAGNOSIS.—We possess herein a very valuable means of obtaining information in regard to the contents, and, in a measure, in regard to the nature, of abdominal and pelvic tumors. Aspiration for diagnosis, when carefully performed, may be said to be practically free from danger, although in general it is wiser to explore at the patient's house. It is necessary to remove only a small amount of fluid; such, for instance, as may be drawn into the ordinary hypodermic syringe. The large Dieulafoy aspirator is therefore, for

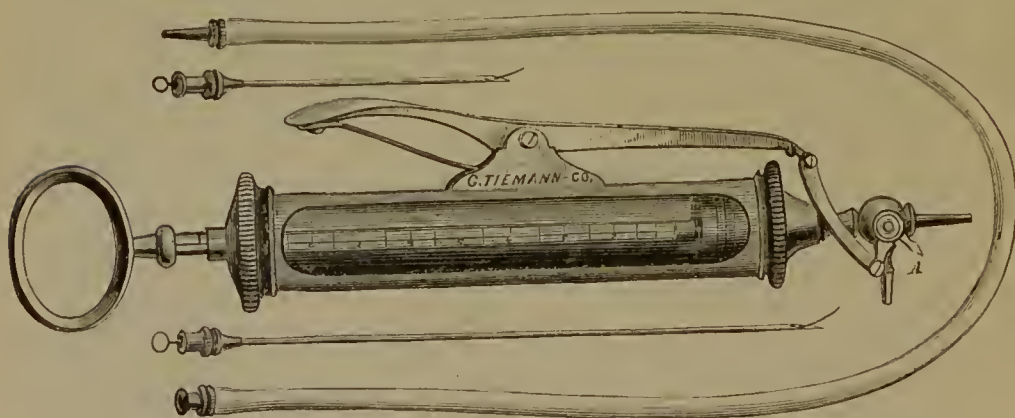


Dieulafoy's Aspirator.

diagnostic purposes, not requisite. A long needle, attached to the pocket hypodermic syringe, will reach deep-seated tumors, whilst, of course, the usual needle will suffice to explore superficial tumors. A very convenient portable aspirator is shown in the annexed cut.

Whatever the locality to be aspirated, careful preliminary disinfection should be the rule. In aspirating through the vaginal vault the needle may be passed along

FIG. 138.



Emmet's Aspirator Syringe.

the finger and thrust into that portion of the tumor where fluctuation is most distinct, avoiding, of course, a part where pulsation marks the

presence of an artery ; or else the vaginal vault may be first exposed through Sims's speculum. The gross appearance of the fluid withdrawn will frequently make our diagnosis ; as, for instance, where blood is obtained from a post-uterine tumor (hæmatocele) or pus (pelvic abscess). The differential diagnosis of abdominal tumors, by examination of the fluid removed, will usually require resort to the microscope, and even then it is still an open question as to whether the characteristics are unfailingly diagnostic of the special form of growth.

It is not in place here to describe the chemical tests to which the fluid may be subjected or to broach the subject of the "ovarian cell." Such questions will be discussed elsewhere. The point at issue will ordinarily lie between ovarian cysts, intraligamentous cysts, and fibrocystic growths of the uterus. Cystic growths of the liver and kidney may usually be recognized under the microscope by the presence, in the first instance, of degenerated liver-cells and cholesterin ; in the second instance, of urea or uric acid. Hydatid cysts are recognized through the characteristic hooklets of the parasite. Finally, as pointed out by Mundé, the aspirator needle will often reveal to us the reason why an old pelvic cellulitis will not yield to routine treatment, by withdrawing a small quantity of pus situated so deeply as not to yield fluctuation to the examining finger.

GENERAL CONSIDERATION OF GYNECOLOGICAL SURGERY.

By E. C. DUDLEY, A. B., M. D.,
CHICAGO.

ANTISEPSIS.

INASMUCH as the minor gynecological operations which are performed for the relief of maladies that are not often fatal, nor even always disabling, have occasionally been followed by sepsis, metropéritoneal inflammations, cellulitis, and sometimes even by death, therefore the practitioner in the hope of spontaneous recovery has often preferred palliative and temporizing measures, however unpromising, to the exclusion of surgical measures, however rational. But the application of the antiseptic principle now renders the minor gynecological operations and office manipulations comparatively free from danger.

PROPHYLAXIS.—The essential object of antiseptic surgery is cleanliness—not æsthetic but surgical cleanliness. To secure and to maintain surgical cleanliness many antiseptic materials have been employed, of which the most generally approved is carbolic acid, but the solutions should be made with great care, lest a part of the acid settle to the bottom of the vessel, and, being pure acid instead of solution, produce a serious burn when applied. The addition of 10 per cent. of glycerin to the pure acid renders it more easily soluble. A saturated solution of boric acid or a 3 per cent. solution of salicylic acid is free from caustic properties and is an excellent antiseptic. Permanganate of potash in solution decomposes so readily that it is unreliable for antiseptic purposes. Solutions of corrosive sublimate may be conveniently made by mixing a 10 per cent. alcoholic solution with sufficient water to make the required strength, which should be from 1 : 1000 to 1 : 10,000. The stronger solutions are adapted to the cleansing of the hands and other cutaneous surfaces, and the weaker for washing the sponges during operations. Corrosive sublimate tarnishes metallic instruments and destroys their plating, but has the advantage of being odorless and in ordinary solutions of not roughening the skin. It is a most reliable germicide.

The soap, glycerin, vaseline, or oil which is usually kept by the operator's table for lubrication of the fingers and instruments may be contaminated with gonorrhoeal or other virus, and may thus become a medium of infection. Neither the fingers nor the speculum, therefore, should be brought in contact with the lubricating substance unless they be free from vaginal and other secretions. The camel's-hair pencil brush and the sponge cannot be properly cleansed, and they are therefore unfit for repeated use. Absorbent cotton wound upon an applicator or stick or grasped by dressing-forceps may be used for purposes of medication or for wiping out the vagina, and should then be destroyed. No special cleansing of the vulva and vagina is required for ordinary office manipulation of these organs except the vaginal douche, which the patient usually takes before applying for treatment. If the intra-uterine cavity is to be instrumentally or digitally explored or treated, it is best to wipe out the vagina with dry absorbent cotton, and then with absorbent cotton saturated with a 5 per cent. solution of carbolic acid in glycerin or with a solution of corrosive sublimate, 1 : 2000. By this means the endometrium is protected against the entrance of septic matter, which otherwise might be carried in from the vulva or vagina on the instruments. But previous to any surgical operation on the genital tract or in the abdomen the field of operation and whatever may possibly be brought in contact therewith should be rendered surgically clean, and so maintained throughout the operation and during convalescence. This treatment relates alike to the most trifling and to the most severe operations, because the former are by no means free from danger of fatal sepsis, and because a performance of seemingly minor importance in the beginning may end accidentally or purposely in opening the abdomen or in some other capital operation. Therefore, the vulva should be thoroughly and repeatedly washed with tar soap and water, and the hot vaginal douche should be applied twice a day during the week previous to operation, each douche to contain a small quantity of castile or tar soap, except the last to be given just before operation, which should be a solution of corrosive sublimate, 1 : 4000.

The ordinary practice of simply cleansing the instruments after each examination or treatment in water or soap and water is inadequate and unsafe. *Æsthetic* cleanliness does not absolutely destroy virus and prevent its instrumental conveyance from one patient to another. Perfect surgical cleanliness, however, may be secured in the following manner: First, let the instruments be carefully washed in the ordinary way, with hot water and soap; then let each instrument be thoroughly wiped over with absorbent cotton saturated with carbolic acid and glycerin, equal parts. To do this easily two strong forceps are needed—one in the left hand to hold the instrument, and the other in the right to hold the cotton. The instruments thus moistened with acid are now thrown into

a pan containing water which has been boiled and filtered. This water and the adherent acid make an excellent solution in which to keep the instruments during an operation. If the instruments have been unusually exposed or if they are to be used in the abdomen, it is well to render the disinfection absolute by passing them slowly through the flame of a Bunsen burner or of a spirit-lamp before applying the carbolic acid.

The cleansing and disinfection of the operator's hands and nails even after ordinary digital examination are imperative, not only to guard against the carrying of poison to the patient, but to prevent self-inoculation of specific or non-specific virus through some abrasion upon the hand.

The annoying presence of fecal matter during a surgical operation and its possible septic results may be avoided by giving the preparatory cathartic so early that its action will be complete on the day before. In order to render the sponges free from foreign and septic matter, first thoroughly beat and wash out all the sand (this may require hours of patient labor); then soak them over night in dilute hydrochloric acid, to dissolve out calcareous matter; and after washing out the acid, the sponges, which will then be much softer and more elastic, may be put away in self-sealing fruit-jars containing a 5 per cent. solution of carbolic acid or a 1 : 2000 solution of corrosive sublimate, the solution to be changed every week. The boiling of sponges is an excellent antiseptic measure, but it causes great shrinkage and hardening, and very much lessens their absorbent qualities.

The ligature and suture silk may be made thoroughly aseptic by boiling it for five minutes in pure carbolic acid, and then for twenty minutes in a 5 per cent. solution. The best braided silk thus treated may be kept for months without injury in small wide-mouthed bottles well corked, or in special ligature bottles, containing a 5 per cent. solution of carbolic acid. The braided silk is preferable to the twisted, because the latter is usually injured, sometimes destroyed, by boiling in pure carbolic acid.

The field of operation, rendered aseptic in the manner already described, may be kept so during the operation if attention be given to the cleanliness of hands, sponges, instruments, and other appliances. The occasional irrigation of the wound during the operation, and especially while it is being closed with sutures, is of great value to ensure perfect contact of the wound surfaces without the intervention of blood or other foreign bodies.

The object of after-treatment is to maintain cleanliness. At the end of the operation all particles of tissue and clots of blood should be removed and the parts thoroughly cleansed by the hot-water vaginal douche, which should be repeated every twelve hours until several

days after the removal of the sutures. After operations on the external genitalia the douche should also be given after each evacuation of the bowels or bladder.

Schroeder and other German operators employ constant irrigation during operation. This requires the patient to be in the dorsal position, and when the operation is intravaginal necessitates the use of Simon's speculum. (See Fig. 139.) Dr. Engelmann of St. Louis, in a communication to the American Medical Association, 1885, strongly advocates this method, which he has improved by the employment of hot antiseptic solutions for the irrigating fluid. He uses a hot solution of corrosive sublimate, 1 : 2000, or a 2 per cent. solution of carbolic acid made with boiled and filtered water. A special assistant, standing somewhat to the rear and to the left of the operator, manages the douche. A fountain syringe or bucket contains the fluid, which is conducted to the wound through a rubber tube five feet long, supplied with nozzle, and a stopcock to be controlled by the thumb of the hand which holds the nozzle. The opening in the end of the nozzle is one-eighth of an inch in diameter. The bucket, placed about three feet above the field of operation, gives enough force to the stream to keep all blood constantly washed away, which is to be done with an even, steady current directed just above the field, and regulated, without splashing, according to the amount of hemorrhage. The temperature of the irrigating fluid should be about 120° F. The hand which holds the speculum as the water flows over it would recognize excessive heat while the patient is under ether. The external genitalia may be guarded with lard as an additional safeguard against scorching. The urethra is especially sensitive to hot water, and should therefore be avoided in directing the stream. The hot douche by reason of its hæmostatic and cleansing properties lessens the flow of blood and keeps the parts clean, and, inasmuch as it removes all necessity for sponging, it shortens the time of the operation. The antiseptic value of the hot douche is proved by the fact that its advocates successfully employ silk sutures, which with the ordinary methods of operation often cause suppuration and failure of union.

After the sutures have been tied the wound is to be dried with absorbent cotton dusted with iodoform and covered with iodoformed cotton or gauze, to be removed in four days; then the parts should be again dried, dusted, and repacked. Two or three dressings may be required before the removal of the sutures, after that but one. Operations on the external genitals, however, necessitate the frequent renewal of at least a part of the dressing to provide for the action of the bowels and for micturition; but in such cases the hot-water vaginal douche repeated two or three times a day would be preferable to the dry antiseptic dressing.

The leading features of the German method, as modified by Engelmann, are Simon's speculum, the dorsal decubitus, the hot antiseptic douche, the absence of sponges, and the simplicity of after-treatment. The advantages claimed are greater cleanliness, simplicity, and speed.

TREATMENT OF SEPTIC GYNECOLOGICAL WOUNDS.—Certain natural conditions are favorable to the healing of wounds on the cervix and vagina. The opposite vaginal wall in contact with the wound excludes the air and acts as a compress, and the vagina itself is an excellent substitute for the drainage-tube. But the conditions after intra-uterine operations are less favorable, because the uterine canal is at an acute angle to the long axis of the vagina, and the cervical portion of this canal, naturally narrow, may have become narrower from disease. Therefore, secretions accumulating in the uterine cavity may not be easily expelled by force of gravity or by uterine contractions, but, on the contrary, may be confined and become infectious with inflammatory and septic results. The condition simulates that of a deep abscess at the end of a long and tortuous sinus. On general principles the therapeutic indication is clearly to cleanse the cavity and to keep it as nearly aseptic as possible by irrigation. Although this treatment is often followed by excellent results, it, unfortunately, is not free from grave objections, and often proves even more dangerous than the disease. Sometimes the stimulating presence of the irrigating fluid or of the cannula through which it is injected causes the uterine walls to contract upon the instrument so forcibly that the return flow is impeded, and the fluid may pass into the Fallopian tubes, especially if they have been dilated by disease, with grave inflammatory or septic results; moreover, intra-uterine injections without invasion of the Fallopian tubes have many times been followed by painful uterine contractions, pelvic inflammation, and death. These injections are therefore only to be employed when the canal throughout is open or can be made sufficiently open to permit free outflow, and even then with great caution. To guard against obstruction of the outflow by contraction of the uterus upon the instrument it is necessary to use some one of the double uterine catheters—Molesworth's, Nott's, or Bozemann's, for example—which have been specially devised for the purpose, and which are similar in construction to Skene's double catheter for irrigation of the bladder. Preparatory dilatation may be required before intra-uterine irrigation can be safely undertaken.

The treatment of septic wounds in the uterine cavity involves some of the vexed questions in gynecology. It is often difficult to determine whether the disease is confined to the uterus or whether the wounded surface has not rather served as an avenue through which bacteria may have passed to the pelvic cellular tissue or to the peritoneum, and there produced results which not only could not be reached by intra-

uterine treatment, but which such treatment might even exaggerate. The patulous condition of the uterine canal in puerperal cases makes the organ easily and safely accessible, and the treatment therefore more effective. The most efficient antisepsis in purely surgical gynecology is generally prophylactic.

OPIMUM, QUININE, AND ICE.

In addition to antisepsis certain other precautions against cellulitis, peritonitis, and metritis should be enforced, especially in cases predisposed by a previous attack. Preparatory to operation the patient may be fortified by full doses of quinine, and for two or three days after the operation this should be continued and supplemented with opium to control pain, and with the ice-bladder over the hypogastrium. The thin gum rubber ice-bladder is most convenient, but the ordinary sheet gum rubber two feet square, such as dentists use for the rubber dam, may be substituted by gathering up its sides and corners above the ice and tying them with strong twine. To prevent the annoying condensation of water on the outside of the rubber bag another piece of rubber or oiled silk should be wrapped about it. Great reliance may be placed upon opium, quinine, and ice, not only for prophylaxis against inflammation, but also as a remedy in the acute stage. Ice is much more certain in its results than the time-honored and conventional hot flaxseed poultice.

WHEN TO OPERATE.

It may be urged as a general, though by no means a universal, proposition that the female genitalia should be exempt from all interference during menstruation. For example, it would be unwise to operate for laceration of the cervix or perineum or for vesico-vaginal fistula during menstruation. But when menstruation is so long continued or so profuse as to endanger health or life, immediate interference may be demanded. Indeed, it has not been proved that operations are decidedly more dangerous in the menstrual than in the intermenstrual period. The presence of the menstrual fluid, however, is unfavorable, though not usually disastrous to union by first intention. An operation if performed immediately upon the cessation of the flow might cause it to reappear, and if too near to the anticipated period it might excite premature menstruation. The best time, therefore, is between the third day after the cessation of one period and the tenth day before the anticipated appearance of the next.

The question of primary or secondary operations after the puerperal lacerations has been much discussed. Emmet's operation for laceration of the cervix should be delayed until after the puerperium, though a

few cases of the immediate operation successfully performed have been reported. For laceration of the perineum, however extensive, the immediate operation is desirable for two reasons: The torn parts can be accurately adjusted to their former relations, which is almost impossible in the secondary operation; and the operation if well performed generally results in union, and thereby protects the patient against septic infection through the torn surfaces. The writer therefore would advise the primary operation of perineorrhaphy even as late as two days after delivery. He has repeatedly operated on the second and third days, and once on the ninth, and with scarcely an exception the delayed operation has resulted in satisfactory union. If, however, the primary operation has been delayed for a number of days, it is best before introducing the sutures to denude with the curved scissors a narrow strip all around the torn surfaces, in order that fresh surfaces may be brought together. A delay of a few hours after delivery ensures greater freedom from capillary oozing from the torn surfaces, which sometimes occurs after closure of the wound and which may prevent union; and moreover, if anaesthesia be required, it is better to wait for permanent retraction of the uterus, otherwise the anaesthetic may cause relaxation and consequent uterine hemorrhage.

It is the duty of the accoucheur at the close of the puerperium to examine the uterus, vagina, and perineum, and to repair any puerperal laceration or injury before its evil results have developed. Operations may be necessary, therefore, during lactation. The child should be kept from the breast only until the mother has fully recovered from the anaesthetic.

Operations during pregnancy should not be undertaken save in rare cases in which the life or health of mother or child is seriously involved. Matthew D. Mann¹ of Buffalo has collected 90 cases in which gynecological operations have been performed on pregnant women; of these, abortion followed from the operation in 20 cases; and of these 20, only 4 died. His conclusions, which, as he says, may or may not be verified by further observations, are as follows:

“1. Pregnancy is not so decidedly a bar to operation on the pelvic organs as is generally supposed. The results, however, vary with the operation and the organ operated upon.

“2. Union of denuded surfaces is the rule, and the cicatricial tissue formed during the earlier months of pregnancy is strong enough to resist the shock of labor at term.

“3. Operations on the vulva involve very little danger either to mother or child.

“4. Operations on the vagina are likely to cause severe hemorrhages, but are not otherwise dangerous.

¹ *Gynecological Transactions*, 1883, vol. vii.

"5. Venereal warts and vegetations of large size and non-syphilitic are best treated by removal, whether they occur in the vagina or are confined to the vulva.

"6. Applications of nitrate of silver and astringents of this class may be made with safety to the vagina and cervix. Diffusible poisons, like carbolic acid or iodine, should not be used pure or in strong solutions for such applications.

"7. Operations upon the bladder and urethra are not dangerous or likely to be followed by abortion.

"8. Operations on the rectum involving the sphincter ani, even if slight in their character, are dangerous.

"9. The operation for vesico-vaginal fistula should not be undertaken during pregnancy, as the dangers of hemorrhage and abortion are considerable.

"10. Plastic operations on the cervix and perineum may, if necessary, be undertaken in the earlier months of pregnancy with a fair prospect of success, and with a good chance that the results may not be impaired by labor.

"11. Small polypi of the cervix may best be treated by torsion or strong astringents. If cut, there is some danger of abortion following.

"12. Large polypi may, if causing hemorrhage, be removed at once, with a fair chance of good results. If not doing any harm, then removal is best left until near the close of pregnancy.

"13. Cancer of the cervix discovered during pregnancy should, if possible, be removed at once."

The possible necessity implied in the tenth proposition, which would demand a plastic operation on the cervix or perineum of a pregnant woman, must be extremely rare.

Two or more gynecological operations may safely be undertaken at one time if the patient be in good condition, if the operations do not conflict one with the other, and if the operator be rapid and dexterous. Trachelorrhaphy and perineorrhaphy, and sometimes trachelorrhaphy, anterior elytrorrhaphy, and perineorrhaphy, are permissible at one sitting. Trachelorrhaphy and the operation for hemorrhoids are often combined. The author has frequently operated for laceration of the perineum and for hemorrhoids at the same time, and always with satisfactory results. When operations on the cervix and anterior vaginal wall are combined with perineorrhaphy, the cervical and vaginal sutures must not be removed until the fourth week, when the perineal union will be firm enough to withstand moderate distension of the vulva by the speculum. Trachelorrhaphy should not be combined with ennetting, dilatation, incision, or with any other intra-uterine operation, because operations on the uterus, especially on the interior of the uterus, are peculiarly liable to be followed by metro-peritoneal inflam-

mation and sepsis, and because trachelorrhaphy would interfere with free drainage of the secretions from an intra-uterine wound, and would thereby increase the danger. Moreover, an accumulation of coagulated blood might be forced by uterine contraction through the closed cervix and thereby destroy the union.

During epidemics of infectious or contagious diseases operations on the female genitalia are prohibited by the increased liability to sepsis and pelvic inflammations, and if possible should be avoided; nor should they be undertaken while the patient is suffering from any acute disease. The immediate operation of perineorrhaphy, for example, usually fails if closely followed by inflammation of the mammary gland.

The occasional necessity for surgical interference during the acute stage of pelvic inflammation justly excites the greatest fear, yet the dread of such interference is sometimes exaggerated. The septic and inflammatory results of a gangrenous intra-uterine fibroid or of the secundines of an abortion might be vastly more dangerous than the operation for their removal.

PREPARATORY TREATMENT.

Syphilis, gout, rheumatism, Bright's disease, purpura, or faulty nutrition from any cause may prevent union, and may therefore require constitutional tonic and hygienic treatment preparatory to operation.

In the presence of a periuterine exudate and thickening, with fixation of the uterus, which always persist for a variable time after pelvic cellulitis and peritonitis, it is safer to defer all surgical operations until time and treatment have reduced the products of inflammation and the periuterine tenderness to a minimum, and until the mobility of the uterus has returned. While the slightest trace of a former cellulitis or peritonitis exists, an operation, however trivial, may result in a fatal recurrence of the inflammation. In such conditions, therefore, it is a safe rule to delay operation. Dr. H. C. Coe,¹ on the other hand, has shown that old chronic thickenings are not always the material products of inflammation, but may be the simple result of cicatricial contractions following local peritonitis, and that they are not a positive contraindication to operation.

The objects of local preparatory treatment are not only to remove the products of inflammation, but to render the field of operation as free from disease as possible. A lacerated cervix in a state of granular erosion and cystic degeneration, or a vesico-vaginal fistula encrusted with phosphatic deposits, would not give the greatest promise

¹ "Transactions of the Woman's Hospital Alumni Association," *American Journal of Obstetrics*, February, 1886.

of union by first intention. Therefore, the hot-water vaginal douche, iodine applications, the daily tampon of absorbent cotton saturated with pure glycerin or glycerin combined with alum, tannin, or iodoform, and the puncturing of retention-cysts, may be required for many weeks before the cervix is in a condition favorable for union. The fistula may require long and patient vaginal dilatation before its edges can even be approximated. But sometimes the induration, fixation, and periuterine tenderness do not yield to the usual treatment of hot water, glycerin tampons, iodine, and rest; numerous cases of granular erosion of the cervix are not influenced by topical applications, however long continued. In some cases neither the general nor the local condition can be materially improved except by a successful plastic operation; then the gentle and rapid manipulations of an expert operator may result in less injury to the nervous system of a debilitated patient, in greater freedom from inflammatory reaction, and in more satisfactory union, than an inexperienced operator could secure under more favorable conditions.

Emmet recommends a hot vaginal douche of 120° F. to be given for thirty minutes just before an operation. This is for the double purpose of cleansing the vagina and of so constricting the capillaries that hemorrhage from denuded surfaces may be partially prevented. Just before giving the anæsthetic the operator should make a careful examination by conjoined manipulation to satisfy himself that the patient is free from cellulitis or peritonitis which may have become active since the examination.

The dress of the patient should be such as would ordinarily be used in bed, and should be supplemented by open drawers, stockings, and a flannel blanket. The night-dress may be drawn up about the waist to protect it from blood, and a large folded towel or sheet may be placed under the patient's hips to keep the blanket which covers the table from being soiled.

OPERATION-TABLE.

The operation-table should be approximately 48 inches long, 24 inches wide, and 27 inches high. The ordinary kitchen table or narrow dining-table, with the leaves down, covered with a blanket or quilt, fulfils all the requirements. Greater length is objectionable, because when the thighs are flexed and the hips drawn toward the operator, the head should be near to the anæsthetizer, who stands at the end of the table opposite the operator. A chair or stand may be placed temporarily for the feet while the patient is being etherized. The bed is too low, too yielding, and too large for operative purposes. An operation-table specially devised for hospital practice should have attached at the end a copper or porcelain basin, into which the water

may flow should it be necessary to wash out the bladder or vagina during operation or to operate under the hot antiseptic douche.

ANÆSTHESIA.

The principles which apply to anæsthesia for surgical purposes in general apply also without change for the operations of gynecology. Sulphuric ether is safer than chloroform, and should therefore be preferred, however short the operation may be. In exceptional cases complete anæsthesia by ether proves very difficult or impossible. The Vienna mixture, composed of one part alcohol, two parts chloroform, and three parts ether, may then be substituted until anæsthesia is complete, when the ether should be resumed. Emmet has pointed out that when the kidneys are not sound, chloroform is much safer than ether, and should therefore always be used under such conditions.

The hydrochlorate of cocaine used hypodermically at or as near as possible to the field of operation, in doses of one half grain or more, produces perfect local anæsthesia of short duration, which may be prolonged by repeating the dose. Many of the minor gynecological operations, such as curetting, dilatation of the uterine canal, division of the cervix, and unilateral trachelorrhaphy, may in this way be performed with little or no pain. The maximum dose of cocaine has not been fixed, but it has been given in doses of several grains. As a local anæsthetic it is more reliable when used hypodermically than when brushed over a mucous or cutaneous surface. Intolerance by idiosyncrasy has occasionally been observed, but the possible dangers of the drug are unknown. A 4 per cent. solution sprayed over the Schneiderian membrane has caused alarming symptoms.

MATERIALS FOR SUTURES.

Silk, catgut, and silver¹ are the materials most commonly employed for sutures in gynecological operations; each has its peculiar advantages and disadvantages; neither is universally to be preferred.

Silk.—The braided absorbs less moisture and is superior to the twisted silk both for sutures and ligatures. The best braided silk is that of Archibald Turner & Co. No. 7 is suitable for sutures in plastic operations on the perineum, vagina, and cervix, but it is too heavy for the ligation of small vessels. Silk sutures and ligatures, if rendered thoroughly aseptic according to the directions given in the section on Gynecological Antisepsis, will remain aseptic for four or five days, and

¹ Silver-plated copper-wire, which is quite as good as pure silver for plastic operations, can be obtained of Codman & Shurtleff, Boston, at about one-eighth the cost of silver.

if protected by aseptic dressings—which in gynecological work is not always possible—they may remain clean for a week, but after that, in consequence of their absorbing qualities, they are liable to become septic and to cause suppuration. Sutures and ligatures of silk in the abdominal cavity, however, do not become septic or produce suppuration if the operation has been aseptic, and they may therefore be left permanently, being more reliable than catgut.

Catgut, if aseptic when used, is less liable to produce suppuration than silk; it usually disappears by absorption in four or five days—makes an excellent ligature for small vessels in plastic operations, in which it may be cut short and the wound closed over it. Catgut sutures are useful also for operations on the vaginal wall or cervix when performed in connection with perineorrhaphy, because they disappear in a week by absorption, and thereby obviate the necessity of distending the recently-united perineum for their removal. But the absorbability of catgut may cause it to disappear too soon, and the wound then, deprived of needed support, may reopen. To guard against this, Lister advises that it be soaked for thirty-six hours in a mixture of chromic acid 1 part, carbolic acid 200 parts, and water 4000 parts, and then dried. Just before using it should be moistened with carbolic-acid water. M. D. Mann of Buffalo, after considerable experience, says that catgut prepared in this way gives little or no trouble from too rapid absorption.

The silver suture, with which Marion Sims demonstrated the curability of vesico-vaginal fistula, is most frequently employed for gynecological plastic operations in the United States. It is specially adapted for plastic surgery, because it cannot by the absorption of moisture become septic and produce inflammation and suppuration, with consequent swelling and strangulation of the included tissues. It is indeed not likely to cut through or to cause strangulation, even though left in place for a month. No. 26 silver wire is generally recommended for perineorrhaphy, No. 27 for trachelorrhaphy, and No. 28 for vesico-vaginal fistula; but the heavy No. 26 wire is less liable to cut, gives better support to the wound, and is generally suitable for all plastic gynecological operations.

Comparatively speaking, aseptic silk or catgut sutures may be used for any plastic operation, and in the hands of a skilful operator they usually prove satisfactory; but the former become septic in a few days, and the latter may be absorbed too soon; either material, therefore, is less reliable than silver. Silver sutures are generally to be preferred in plastic operations, and especially in operations which require them to be left for more than six or seven days, or after which there may be traction on the sutures or a tendency to gaping of the wound. Such operations include trachelorrhaphy, vaginal fistula, and the extravaginal portion of colpo-perineorrhaphy. But in the intravaginal portion

of colpo-perineorrhaphy silk or catgut is preferable to silver, and catgut is specially applicable to the vaginal portion of Emmet's new operation of perineorrhaphy. For trachelorrhaphy silver sutures are preferable even when the perineum is closed at the same time, because in uterine tissue they do not cause suppuration even if left for three or four weeks, when the new perineum will be firm enough to permit the careful passage of the speculum for their removal.

ASSISTANTS.

Four assistants are usually required for a gynecological operation—one to give ether, one to wash sponges, one at the operator's left to hold the speculum, and one at the operator's right to sponge and render other assistance. If the operation be on the perineum or vulva, and the patient be in the dorsal decubitus, the thighs must be flexed and held in the lithotomy position by the two assistants on the right and left. The assistants in charge of the ether and sponging should be physicians. The washing of sponges and holding of the speculum may be done by nurses. The occasional occurrence of acute synovitis in the knee-joint following operations on the perineum was unexplained until Dr. E. H. Webster of Evanston, Illinois, suggested that while holding the thigh in the lithotomy position an assistant by carelessly throwing his own weight upon the patient's leg or by leaning heavily upon it might flex the joint to a dangerous degree. Various contrivances have been devised for holding the legs when in this position, but they are unnecessary.

MISCELLANEOUS INSTRUMENTS.

When the field of gynecological diagnosis and therapeutics was chiefly confined within the circumference of the cervix uteri, the various cylindrical bivalve and polyvalve specula were seemingly adequate to the needs of the practitioner; but the development of surgical gynecology, especially that relating to the puerperal lacerations and other injuries, dates from the invention of the perineal retractor of Marion Sims.

In the United States, Drs. Sims and Emmet with Sims's speculum, the latero-prone or Sims's position, and the silver suture gave to plastic surgical gynecology its greatest impulse. Then Gustav Simon and his followers in Germany with a modification of Sims's speculum, the dorsal position, and the silk suture popularized the operative method now almost universally adopted throughout Germany.

Sims's Speculum.—In order to appreciate the action of Sims's speculum it becomes necessary to study the effect of the latero-prone or

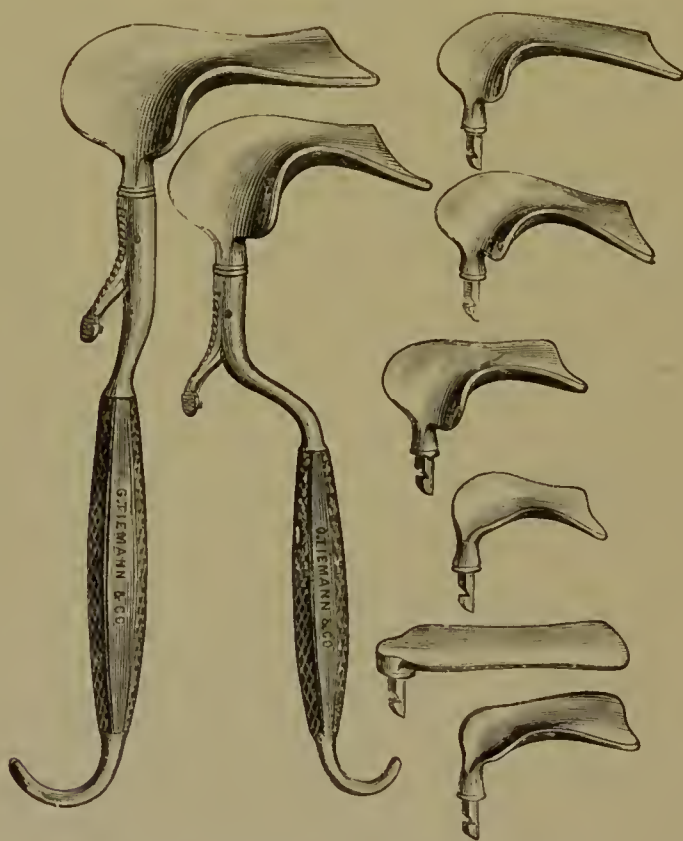
Sims's position upon the pelvic organs. Like the knee-chest position, of which it is a modification, it causes the vagina to fill with air, and the anterior and posterior vaginal walls—or, to speak more comprehensively, the pubic and sacral segments of the pelvic floor—to separate. The speculum then exaggerates the effect of this position by hooking or drawing back the perineum, which exposes almost the entire surface of the widely-opened vagina, and causes the cervix to be drawn somewhat forward toward the vulva. Two requirements are essential to the successful use of Sims's speculum—correct position of the patient and proper holding of the instrument. The patient is to be placed on the left side, the hips being over the left-hand corner of that end of the table which is toward the operator; the knees are to be drawn up toward the abdomen, and the right thigh flexed slightly more than the left. The left arm then rests behind the patient on the table. This permits the right shoulder to be thrown forward and depressed toward the right side of the table, so that the position becomes latero-prone—*i. e.* lateral and slightly prone at the hips, and almost wholly prone at the shoulders. The left side of the head rests upon the table, the face looking to the right. The right arm hangs over the right side of the table, and the long axis of the trunk extends obliquely across the table from left to right.

Modifications of Sims's speculum to make it self-retaining and to dispense with the assistant have been devised by Emmet, Studley, Hunter, Erich, and others, but, for surgical purposes at least, with but imperfect success. Proper holding of the instrument and correct position of the patient will secure more light and space than can be gained by any other means. A detailed description of the manner of using Sims's speculum will be found in the article on "Gynecological Diagnosis." For surgical operations or explorations in the rectum Sims's speculum and Sims's position are incomparably superior to all others.

Simon's speculum (Fig. 139) is a perineal retractor similar to Sims's, but with shorter and flatter blades, which are made of different shapes and sizes, and are adjustable on a handle, so that they may be changed to meet the requirements of the case. It is the favorite instrument of the Germans, and differs from Sims's chiefly in the manner of its use, which requires the patient to be in the dorsal decubitus and the thighs to be flexed as in the lithotomy position. An objection to the instrument is the greater liability of the vesico-vaginal wall to fall down toward the speculum and of the lateral walls to fall together, and thereby to obscure the field of operation. To obviate this, Simon uses a smaller though similar retractor which acts in the opposite direction, like the anterior blade of the bivalve speculum. Lateral depressors also are often required on either side, all of which are more or less in the operator's way. Moreover, the introduction of the sound, curette,

or of other instruments to the interior of the uterus is more difficult in the dorsal than in Sims's position, and if the organ be anteverted or anteflexed the instrument is especially liable to be arrested at some point on the posterior wall of the cervix or at the internal os, and refuse to pass farther. Sims's speculum is more easily held, requires fewer assistants, fewer attachments and depressors, than Simon's. It gives the maximum amount of light and space, and therefore probably never will be superseded by any other instrument.

FIG. 139.



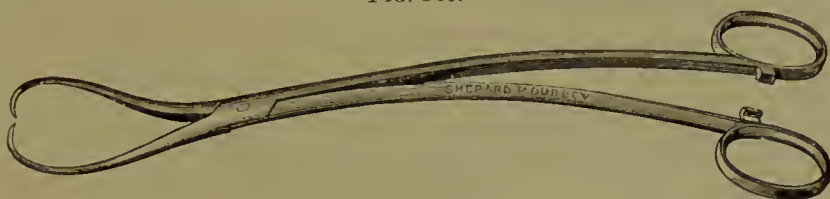
Simon's Specula: blades of various sizes and shapes.

Vulsellum forceps, similar in construction to those shown in Fig. 154, but with heavier blades and longer teeth, are designed for various operations on and about the cervix. They are used for holding the cervix during amputation and for making traction in the removal of a uterine fibroid. Emmet's double tenaculum forceps (Fig. 140) answers the same purpose. It is well adapted for the removal of any intra-uterine mass requiring traction; its teeth lap one over the other when closed, which adds materially to the strength of their grasp; its blades and handles are bent in opposite directions with a sigmoid curve, so

that it may be out of the operator's way when held by an assistant.

Emmet's double tenaculum is used for steadying the uterus during amputation of the cervix or during intra-uterine operations. It is held

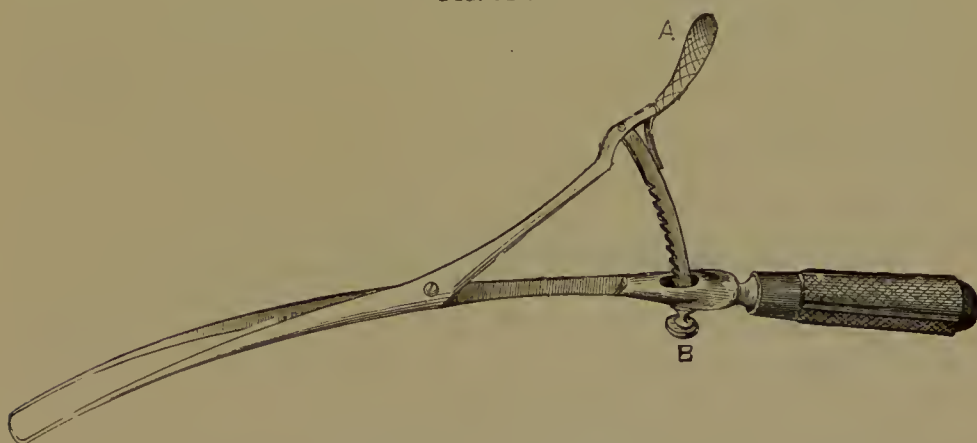
FIG. 140.



Emmet's Double Tenaculum Forceps.

in the left hand, and may be introduced into the cervical canal with its teeth adjusted, as in Fig. 141; then by depressing the thumb-piece at *A* the blades are widely separated, the canal put upon the stretch, and its opposite walls penetrated and held by the teeth. Its hold upon the

FIG. 141.



Emmet's Double Tenaculum.

tissues may be loosened by drawing back the ratchet at *B* with the index finger.

Sponge-Holders.—For intravaginal operations three or four or more

FIG. 142.



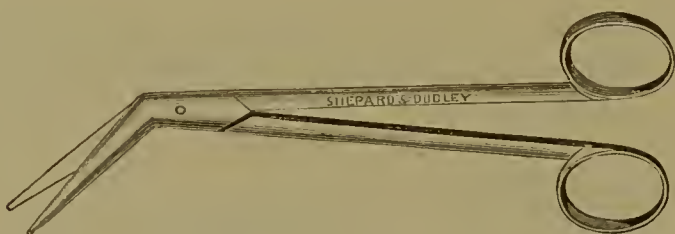
Sims's Sponge-holder.

sponge-holders (Fig. 142), twelve inches long, are usually required, in which sponges trimmed to the desired size and shape may be fastened.

Scissors.—The minor gynecological operations may be performed either with the scissors or with the knife, and the choice depends much

upon the education and habits of the operator. The scissors certainly cause less hemorrhage, and when one becomes accustomed to their use he can work more accurately and more rapidly. Any strong, well-made, slightly curved scissors will suffice, but those of Emmet are specially adapted to intravaginal, perineal, and vulvar operations.

FIG. 143.



Emmet's Scissors for dividing the Cervix.

Fig. 143 shows a pair of blunt-pointed scissors, with straight blades bent laterally upon the shank at an angle of forty-five degrees. They are useful for dividing the cervix, for making an artificial vesico-vaginal or urethro-vaginal fistula, and for dividing cicatricial bands in the vagina.

The slightly- and strongly-curved scissors are almost indispensable

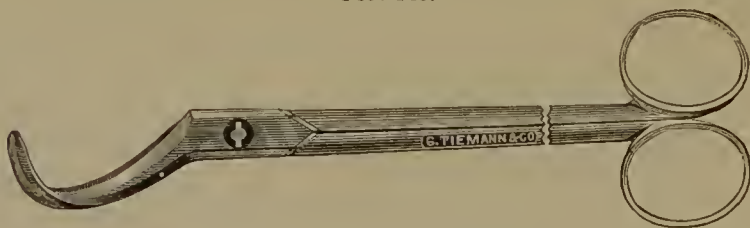
FIG. 144.



Emmet's Slightly-curved Scissors.

for denuding in plastic operations; the slightly-curved (Fig. 144) are used for perineal and for ordinary intravaginal denudation; the strongly-

FIG. 145.



Emmet's Strongly-curved Scissors.

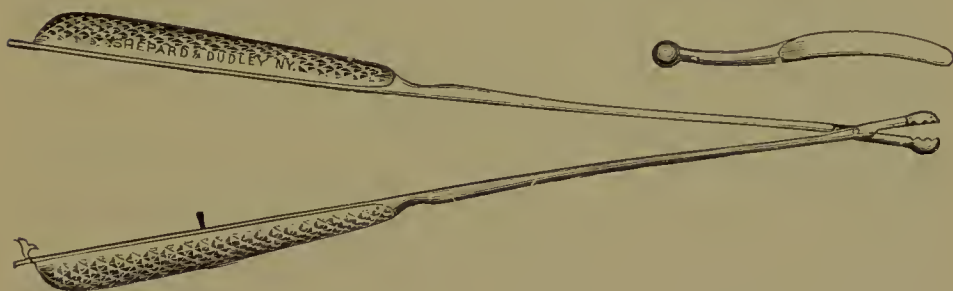
curved (Fig. 145) are convenient for denuding a strip high up across the vagina or cervix uteri in fistula and cervix operations. The scis-

sors represented in Figs. 144 and 145 are curved toward the right, and are intended to be used in the right hand. Emmet mentions also two others with curves to the left, but it is scarcely possible to imagine an operation in which the latter would be necessary.

Emmet's wire scissors, with blades pointed and slightly curved on the flat, are useful for cutting wire, and sometimes for cutting out cicatricial tissue. The slightly-curved scissors of Fig. 144 answer all the purposes for which straight scissors are usually employed.

Emmet's ball-and-socket knife (Fig. 146) has a blade which may be firmly attached at any angle to the shank by closing the handles, which

FIG. 146.



Emmet's Ball-and-Socket Knife.

are provided with a lock at the end. The knife may be used in places which are inaccessible to the scissors.

The Tenaculum.—Numerous tissue-forceps have been devised for grasping the tissues to be denuded or excised, but a properly-constructed tenaculum in the educated hand is the most convenient and effective instrument for this purpose. With the tenaculum the operator can

FIG. 147.



Uterine Tenaculum.

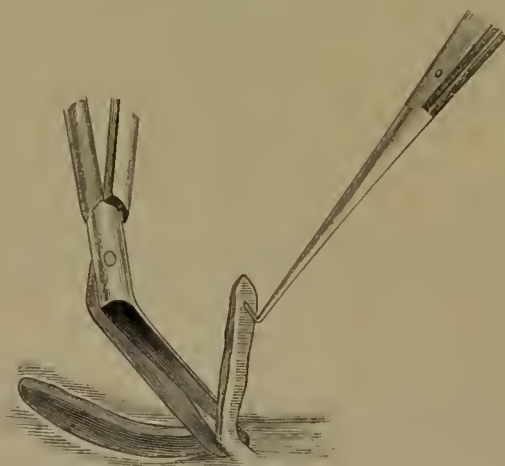
pick up and hold a smaller amount of tissue, and can therefore denude more superficially, than is possible with the tissue-forceps. The instrument (Fig. 147) has a perfectly straight hook a little more than a quarter of an inch long and at right angles to the shaft. It should be so strong and stiff that considerable force may be applied in the line of the instrument without breaking or bending the hook, or in a lateral direction without bending the shaft. The uterine tenaculum is useful not only in denudation, but also in almost every step of a gynecological examination or operation. In some operations as many as four of them may be required.

PLASTIC OPERATIONS.

The subject comprehends all operations for the repair of the puerperal lacerations and injuries, such as laceration of the cervix uteri and perineum and vesico-vaginal fistula. Union by first intention, which is an essential requirement of plastic surgery, will almost invariably result from a correct operation. In certain cases of vaginal fistula in which there has been great loss of tissue from sloughing, failures may arise from the cicatricial character of the parts or from difficulty in holding the edges together. Perineorrhaphy in very fat subjects, especially when the rupture extends through the sphincter ani muscle, may fail after the most skilful operation, but generally the conditions of success are within the control of the operator. These conditions are simple but absolute, and the operator who has neglected them cannot fairly attribute his failure to the debilitated state of the patient or to chance or to accident. Indeed, union must almost invariably follow if the surfaces to be united are properly prepared and kept in contact for a week. The first condition, antiseptis, has been discussed. The others will be presented in the following paragraphs.

DENUDATION.—The patient having been etherized, placed in position, and the field of operation exposed, the surfaces to be united should be denuded. Correct denudation is a prerequisite to healing

FIG. 148.



Denudation with the Tenaculum and Scissors.

by first intention. Surfaces to be united should be so denuded that when brought together they will fit accurately, otherwise a part of the denuded surface, being in contact with an undenuded surface, must heal by granulation and suppuration, which may excessively irritate the rest of the wound, and would always produce cicatricial tissue, which is very

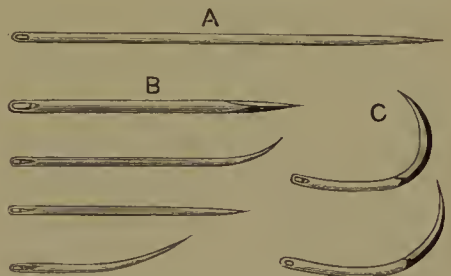
objectionable. The denuded surface should be smooth and free from shreds, which might die and become sources of septic infection. Every particle of membrane or skin within the area of denudation should be scrupulously removed. If the surface be perfectly healthy, the more superficial the denudation the better, but diseased and cicatricial tissues do not readily unite, and should therefore, when practicable, be removed.

Fig. 148 shows the action of the tenaculum and scissors in denuding. The superiority of the tenaculum as a substitute for the tissue-forceps must become apparent to any one who will familiarize himself with its use.

Needles.—A round needle is preferable to one with a cutting edge. The latter makes an incised wound which is generally too large for the suture, bleeds more freely, is prone to suppurate, and requires more time for healing. The former makes a punctured wound which readily shrinks down upon the suture, is less liable to bleed or to suppurate, and heals more quickly after the removal of the suture. Many of the most dexterous operators are partial to the straight needle in preference to the curved, especially when the long needle is used as in perineorrhaphy. The straight needle has two advantages: first, however deeply it may be buried in the tissues, the position of its point can always be determined from its direction and length; second, the force employed in its introduction being in the direction of the needle, it may without danger of breaking be of much smaller calibre than the curved needle, which must be introduced by a force exerted in the line of a tangent to the curve.

The straight needle therefore requires less force for its introduction, is less liable to break, and makes a smaller wound. Moreover, the simple rotation of the needle forceps on its long axis by a turn of the wrist enables the operator to sweep the straight needle around a curve in the vertical plane, or it may be carried around a curve in the horizontal plane by loosening and tightening the forceps grasp upon the needle at very short intervals, so that the angle between the forceps and the needle may change almost constantly during its passage. In this way the straight needle may be made to carry a suture around a curve quite as accurately as the curved needle, and often more easily. Obviously, the lock forceps, which do not permit this freedom of motion, are unsuited

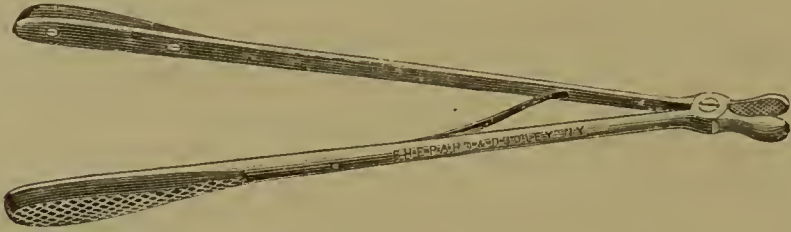
FIG. 149.



A, straight needle for external sutures in perineorrhaphy. *B*, straight and curved needles for operations on the vaginal walls and the cervix, and for vesico-vaginal fistula: the upper needle under *B* is trocar-pointed for very dense tissue. *C*, Simon's strongly-curved needles for vesico-vaginal fistula.

to such manipulations. Fig. 150 represents Emmet's needle-forceps without lock. The eye of the needle if included in the grasp of the forceps may be crushed; to avoid this, grasp it on the proximal side

FIG. 150.



Emmet's Needle-Forceps. The spring between the handles causes them to open when the grasp is relaxed.

of the eye. The plain round point, however sharp, sometimes encounters great resistance in being passed through dense tissue. The trocar point represented in Fig. 149, *B*, or the saddler's point, is less objectionable than the cutting edge, and may be introduced almost as easily.

Various needles with handles attached or detached and of different curves and shapes have been devised, some with eyes at their points, some without eyes, and others of cylindrical form, through which the wire is passed lengthwise from one end to the other. They complicate rather than simplify an operation; they make punctured or incised wounds many times larger than the sutures which they are to contain; they are in no respect superior to the simple needle and thread.

The Application of Silver Sutures.—No. 26 silver wire, the proper size for gynecological operations, is too heavy to be threaded directly into the needle, but it may be easily drawn through upon a loop of silk, cotton, or linen thread secured to the eye of the needle by a half

FIG. 151.

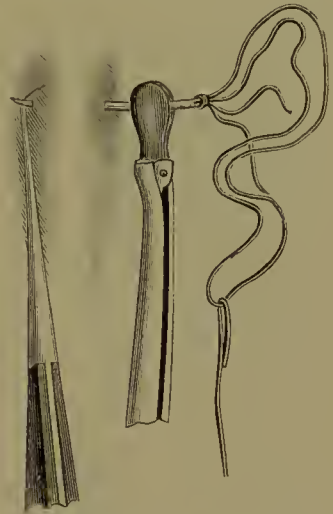


The Thread Loop, ten inches long, secured to the needle by a half knot for drawing through silver wire.

knot, as represented in Fig. 151. The knot should be drawn tight to prevent slipping, and the wire bent sharply over the loop, as shown in Fig. 152.

Before the introduction of the sutures, approximate the denuded surfaces with tenacula to determine whether they are of such size and shape that their union will produce the desired result, and whether accurate coaptation of their margins can be secured without undue traction, which might cause the sutures to cut out. Then hook up the margin of the wound with a tenaculum, introduce the needle, and when its point appears place the tenaculum under the point of the needle and apply counter-pressure, as in Fig. 152, until the needle can be seized and drawn through with the forceps. Some operators use the blunt hook (Fig. 153) for counter-pressure, but a strong tenaculum which will neither break nor bend is often preferable, because it may also be fixed in the tissues at the very point where the operator desires to force the needle through, and it thereby ensures greater precision in directing the needle to its point of exit. The use of the tenaculum also avoids multiplicity of instruments.

FIG. 152.



Showing counter-pressure and the attached wire, nine to twelve inches long, which is about to be drawn through by the thread loop.

Uterine tissue is often so dense that great force is required to drive

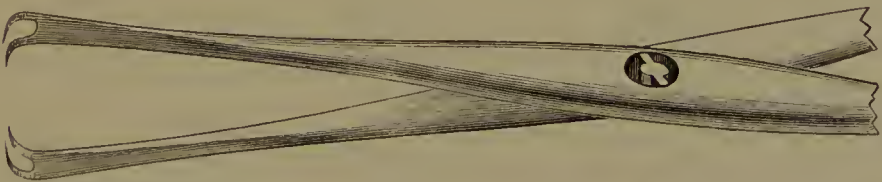
FIG. 153.



Emmet's Counter-pressure Hook, for making pressure beyond the point of the needle as it is passing through the tissues.

the needle through it. For this reason the passing of the needle is often the most trying part of trachelorrhaphy.

FIG. 154.



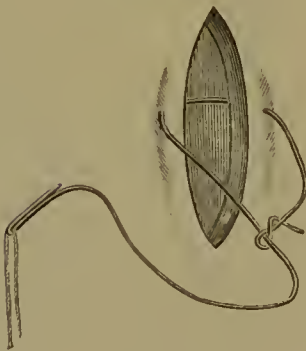
Vulsellum Forceps, with fine short teeth to grasp the cervix in passing the needle for trachelorrhaphy. Between the two teeth of each blade is a deep opening to accommodate the passage of the needle. The instrument is provided with scissor-handles, and is about ten inches long (modified from Hanks).

In making counter-pressure the tenaculum may slip and the uterine receive a violent and sudden jerk, which is not without danger, espe-

cially when often repeated. This may be avoided and the operation facilitated by holding the flap in the vulsellum forceps (Fig. 154) while the needle is being forced through between its teeth. These forceps may be made by filing the teeth of Hanks's forceps shorter and finer, and by filing a deeper opening between the two teeth of each blade. The sutures should be about one-fourth of an inch apart—should include considerable tissue, and if possible to avoid it should not pass through the denuded surface or be in contact with any portion of the wound, because when at a distance from the denuded surface they are less liable to irritate and produce swelling or inflammation, and are therefore less liable to cut.

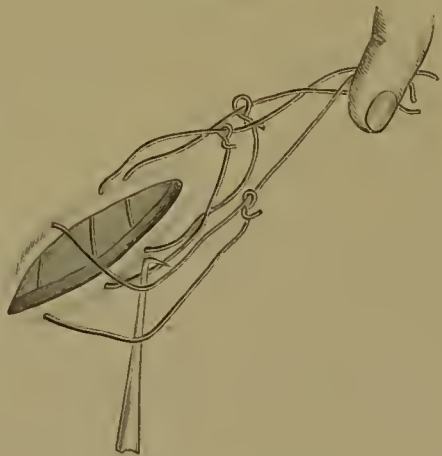
As each wire is drawn through on the thread and temporarily secured by a slipknot, as shown in Fig. 155, it is held out of the way by an assistant until all have been passed. Then, one after another, they are

FIG. 155.



Before twisting, showing a suture in position, with the slipknot.

FIG. 156.



Before twisting, all the sutures in position. One is being separated from the others by a tenaculum preparatory to twisting.

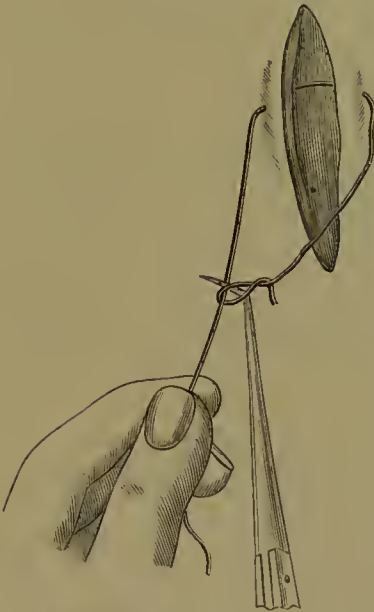
picked up, as in Fig. 156, and the traction is made upon the free end until the slipknot has been drawn down upon the tenaculum within an inch of the wound. (See Fig. 157.)

To prevent the ends of the suture from slipping out of the grasp of the twisting forceps, the wire is twisted for a short distance below the slipknot by rotating the handle of the tenaculum two or three times between the thumb and finger (Fig. 158). The twisting forceps are now applied over the slipknot, the loose wire cut off, and the suture shouldered by the tenaculum (Fig. 159).

When the twisting forceps have been applied and the suture has been shouldered (Fig. 159), the No. 26 wire will be found stiff enough to hold the margins of the wound in contact. The shield (Fig. 161) is

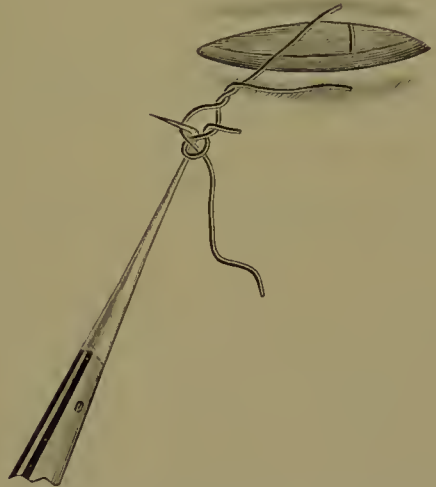
now applied, and the suture is twisted down to the shoulder (Fig. 162), but no farther, because, the margins of the wound being already in

FIG. 157.



The slipknot being drawn down on a tenaculum.

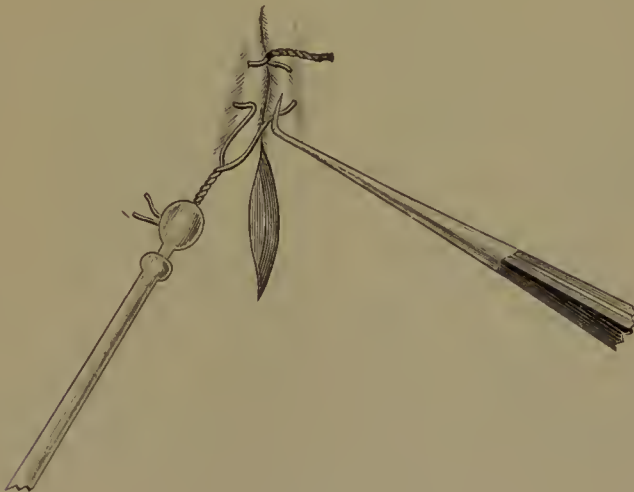
FIG. 158.



Twisting a suture with the tenaculum to prevent the wire from slipping out of the grasp of the twisting forceps.

contact, the wire if twisted beyond the shoulder would strangulate the tissues, and either cut through them or cause sloughing. If the wound

FIG. 159.

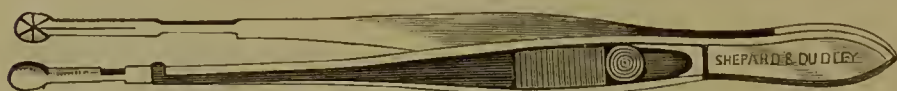


Shouldering a Suture.

cannot be brought together or nearly together by shouldering, it is evident that the traction upon the sutures, even though they be twisted

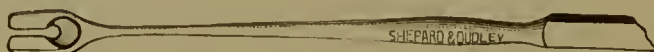
only to the shoulder, may cause them to cut or the flaps to slough, and the operation to fail. The object of shouldering, therefore, is twofold: first, to show that the flaps can be held together without undue traction; second, to limit the twisting and thereby prevent strangulation. The twisted portion of the suture should now be bent down upon the sur-

FIG. 160.



Emmet's Modification of Sims's Twisting Forceps.

FIG. 161.



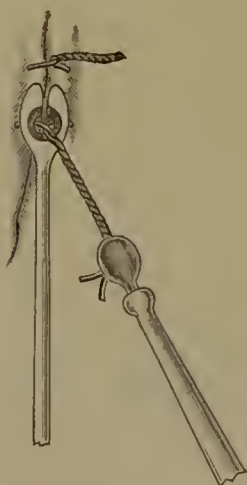
Sims's Shield.

face in the direction where it will cause the least irritation, and cut off about half an inch from the line of union. (See Fig. 163.)

Before twisting the sutures all bleeding points should be controlled by torsion or by fine catgut or fine silk ligatures, cut short. Catgut makes the best ligature for small vessels in the deeper portions of the wound, because of its ready absorbability.

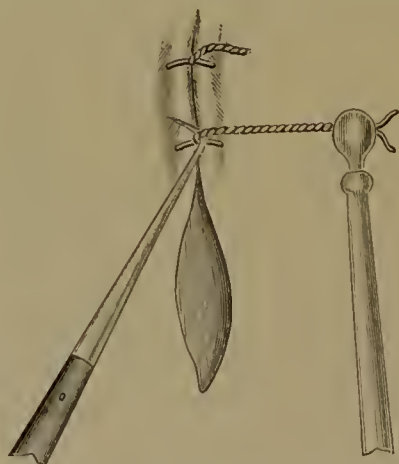
Thorough sponging or irrigation for the purpose of cleansing the

FIG. 162.



Twisting a Suture.

FIG. 163.



Bending the twisted portion of the suture down upon the vaginal surface.

wound during the twisting of the sutures is imperative. Any particle of coagulum or shred of tissue left in the wound will act as a foreign body, will decompose, and may prevent union. Just before twisting, two of the sponges on the sponge-holders may be trimmed to a small

size and to a conical shape with the scissors, for use while the wound is being closed. The practice of operating under the constant hot antiseptic douche enables the operator to discard the sponge entirely and to secure perfect cleanliness. (See Antisepsis.)

The application of the silver suture to the vagina and cervix differs in some details from its application in perineorrhaphy, but for the technique of special operations the student is referred to the special subjects.

The after-treatment has been partially discussed under Antisepsis and other means to prevent pelvic inflammation. Further information may be found in those articles which relate to special operations.

Removal of Sutures.—Sutures about the vulva and perineum should be removed in about seven days. If left much longer they become

FIG. 164.



Removing a Silver Suture.

loose or cause suppuration. In the vaginal walls they may be left, if necessary, several days longer. In the cervix, where suppuration seldom occurs, they should be removed in ten to fourteen days, unless perineorrhaphy has been done at the same time, in which case their removal cannot safely be undertaken in less than three or four weeks. To remove a suture seize the twisted portion of the wire with a dressing-forceps, and with the wire scissors cut the nearest side of the loop. (See Fig. 164.) This tends to hold the freshly-united wound together

during the withdrawal of the wire. If the loop be cut on the farther side, its removal would tend to reopen the wound.

DILATATION OF THE UTERUS.

It is impossible by means of any speculum yet devised to inspect the interior of the uterus, but its cavity may be made surgically accessible to the palpating fingers and to various instruments by dilatation. The principal objects of dilatation are to overcome stenosis or stricture of the uterine canal, to diagnose and remove causes of pathological uterine hemorrhage, such as granulations, polypi, and the remains of abortion, and to cure pathological flexions. The uterus may be dilated by incision, by tents, by graduated sounds, and by dilators with diverging blades constructed on the principle of the glove-stretcher.

Incision of any portion of the uterine canal may be required to render the endometrium accessible for instrumental or manual interference. But incision is specially applicable to the lower part of the cervical canal and to the external os, and is performed for congenital or acquired stenosis to ensure the free outflow not only of menstrual fluid, but also of the uterine mucus, which if retained becomes offensive, irritates the intra-uterine mucosa, and causes hypersecretion. Oftentimes the uterine secretions are so impeded in their passage through the strictured os externum that they accumulate, distend the uterine cavity, and are thrown off at irregular intervals with expulsive pains simulating labor-pains. This explains certain cases in which there is a recurrence in the intermenstrual period of all the painful phenomena of obstructive dysmenorrhœa. In such cases permanent cure succeeds the operation recommended by Fritsch¹ of Breslau, which is as follows: The patient being in Sims's lateral position, the vaginal portion is seized from the inner side of the os with a sharp tenaculum. An incision is then made one centimeter long in the direction opposite to the traction of the tenaculum; this is repeated on the opposite side and in front and behind. The four flaps thus formed are seized one after another with a tenaculum, and about half of each cut away. After this, retraction of the remaining portion of the flaps occurs and the external os remains funnel-shaped. The ordinary bilateral incisions show a decided tendency to reemite, and are therefore objectionable. The incisions may be made with the scissors (see Fig. 143) or with the knife (see Fig. 146).

Schroeder of Berlin² in certain cases, especially of intra-uterine polypi, incises the cervix bilaterally, seizes the posterior lip with a vulsellum forceps, and with his finger as a dilator works his way to the uterine cavity. The uterus dilated in this way and well drawn

¹ *Diseases of Women*, Am. ed.

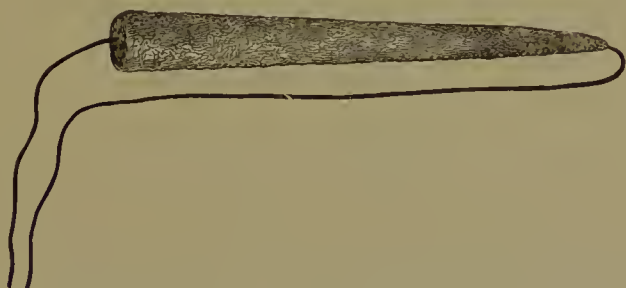
² *American Journal of Obstetrics*.

down is very accessible. In Schroeder's method the lateral incisions extend into the dangerous neighborhood of the parametria. The safety of the operation must therefore depend upon thorough antisepsis. It is impracticable in a rigid uterus to incise and dilate according to Schroeder's method.

TENTS.—Sponge, sea-tangle, and tupelo are the materials commonly used. If introduced into the uterus in the dry compressed state, the mucous secretion, stimulated by their presence, causes them to swell laterally to a diameter two or three times greater, and correspondingly to dilate the canal.

Sponge tents, which have a dilating power of about three times their diameter, are made of disinfected compressed sponge, straight or curved to fit the uterine canal, and perforated from end to end to admit a strong

FIG. 165.



A Sponge Tent with thread passing through it. Before introduction the ends of the thread should be tied together.¹

thread (see Fig. 165), by means of which the tent may be held together during removal. Otherwise a fragment may be left behind and be an unsuspected source of dangerous infection.

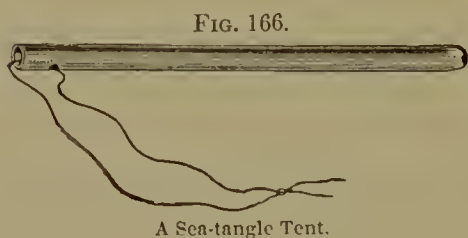
The sponge tent not only expands, but at the same time softens the walls of the uterus, and thereby prepares them for further dilatation and renders the cavity more accessible for surgical manipulation; in this respect it is more effective than tupelo or laminaria, and much more effective than steel dilators, which usually leave the uterus so elastic that immediately after their removal the introduction of the finger or of an instrument for diagnostic or surgical purposes may be impossible without further dilatation. But the softening effect is the result of excessive irritation, congestion, and secretion due to the presence of the sponge. Under such conditions it may, in an incredibly short time, become offensive and dangerously septic from decomposition of the absorbed secretions. It often also becomes so adherent and incorporated with the intra-uterine membrane that portions of the epithelial layer may be stripped off with its removal. The surfaces thus exposed would furnish a ready avenue for the absorption of the secretions. Dis-

¹ *Thomas on the Diseases of Women*, p. 103, 6th ed.

astrous results seldom follow the application of a single sponge tent unless the patient has suffered from a previous cellulitis or peritonitis, but the danger increases rapidly with the introduction of the second and third. Many operators now discard them altogether.

Tupelo tents, made from the tupelo tree (*Nyssa aquatica*), expand less powerfully but more rapidly than sponge to about double their compressed size, and, inasmuch as they do not so readily become offensive from decomposition of the absorbed secretions, they are less dangerous. They are straight and inflexible, and therefore not easily introduced in cases of acute flexion, especially when there is immobility at the angle of flexure. They are, however, very smooth, and slip into place when the canal is straight or nearly straight more easily than sponge. If the tent selected is found on trial to be too large, it need not be thrown away, but may be easily cut down to the required size with the penknife. A standard author has included among the many advantages of the tupelo tent the possibility of recompressing it for repeated use, but for obvious reasons such a practice can be neither safe nor permissible.

Laminaria tents, also called sea-tangle tents, have more expanding power than tupelo and less than sponge, but their action is so slow that they are liable to be expelled from the uterine cavity before they have become sufficiently extended to be self-retaining. They have but one advantage over tupelo, which is their flexibility. After soaking in warm water for a few minutes they may be bent to



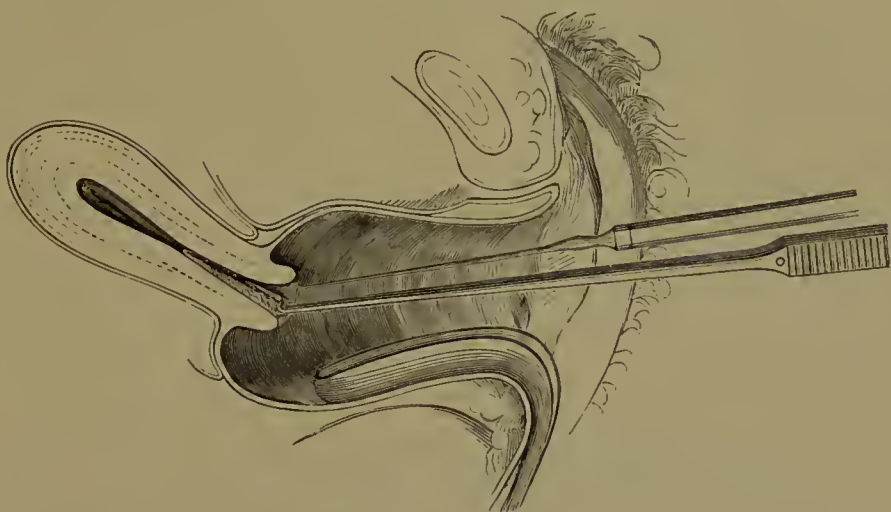
any desired curve, and may therefore be introduced in cases of uterine flexure. Fig. 166 represents a laminaria tent perforated from end to end to make it dilate more rapidly, according to the recommendation of Dr. Greenhalgh of London. Expansion of laminaria is very slow, requiring thirty-six hours for the maximum dilatation.

INTRODUCTION AND REMOVAL OF TENTS.—Unless the uterus be so low that the os externum is near to the vulva, a speculum will be required for the introduction of a tent. Sims's speculum is most suitable, and indeed indispensable in difficult cases, especially when the uterus is much anteflexed or anteverted. Before introducing the tent the vagina and vulva should be thoroughly cleansed, the cervix exposed by the speculum, and the direction and curve of the uterine canal ascertained by the probe; then a tent of corresponding curve should be seized in the forceps and introduced while the cervix is fixed with a tenaculum, as shown in Fig. 167. A small tampon of antiseptic cotton should then be placed against the cervix to hold the tent in place.

The time required for a sponge or tupelo to reach its maximum dilatation is from six to twelve hours. Several small tents may be introduced at one time instead of a single large one.

The tent may sometimes be removed by traction on the attached thread, but when considerable force is required it is better to use the

FIG. 167.



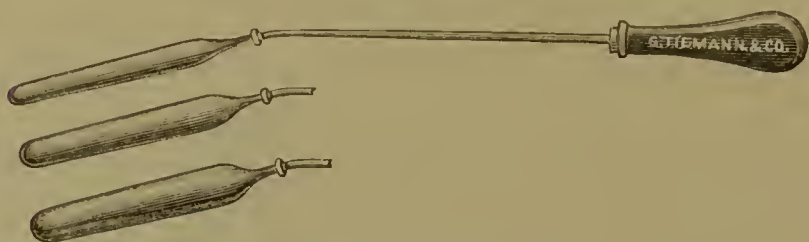
Introduction of a Tent (Sims's).

speculum and forceps, and in making traction to use counter-pressure against the cervix, which may be steadied by placing two fingers against it, or by fixing it with the vulsellum forceps, or by encircling it with the fenestrated end of a Sims's depressor. After the removal of the tent some blood usually flows from the intra-uterine surface, which is usually more or less abraded, especially if a sponge tent has been used, and the endometrium should therefore be thoroughly washed out with an antiseptic solution, to be followed with an application of Churchill's tincture of iodine over the entire uterine cavity. In cases requiring further dilatation the iodine should be omitted until the last tent has been removed. The danger of continuous dilatation by introducing one tent after another is very great. As already stated, the alarming results have generally followed the use of the second or the third tent, seldom the first. A tent should not be allowed to remain in the uterus more than twenty-four hours under any circumstances, and generally not more than twelve.

GRADUATED SOUNDS.—The uterus, like the urethra, may be dilated by means of graduated sounds. Fig. 168 shows Fritsch's uterine dilators. Peaslee, Hegar, and Hanks have devised similar instruments which are equally serviceable. They are particularly adapted to cases in which the abdominal walls are thin and lax, so that the uterus may be easily fixed by the hand over the abdomen, while one sound after

another is forced into the canal until the required dilatation is accomplished. If the abdominal walls are thick and tense, it is necessary to place the patient in the latero-prone position, to use Sims's speculum,

FIG. 168.

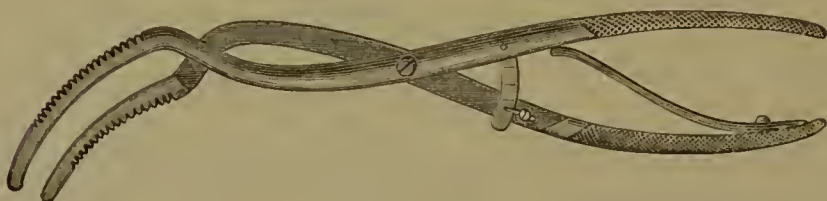


Fritsch's Uterine Dilators.

and during dilatation to fix the cervix with the vulsellum forceps. In such cases the diverging instruments are preferable.

DIVERGING INSTRUMENTS.—Innumerable instruments have been

FIG. 169.

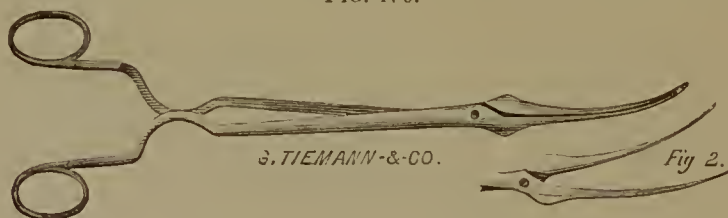


Schultze's Dilator.

devised with blades which diverge and dilate the uterus when the handles are pressed or screwed together. (See Fig. 169.)

Schultze's dilator and Goodell's modification of Ellinger's dilator¹ have serrated blades to prevent them from slipping out during the pro-

FIG. 170.



Nott's Uterine Dilator.

cess of dilatation: this accident is much more liable to occur with the latter instrument, on account of the parallel action of its blades, and notwithstanding strong counter-traction with the vulsellum forceps it does occur in many cases long before dilatation can be completed. The blades of the Schultze's dilator diverge in a fan-like manner, and are

¹ See p. 319 in "Gynecological Diagnosis."

therefore a little more liable to injure the uterus, but they do not slip out, and are therefore to be reserved for cases in which the Ellinger instrument cannot be retained. These dilators are generally too heavy to be inserted until the way has been opened by a lighter instrument, like Nott's (see Fig. 170), or by the smaller graduated sounds (Fig. 168), or by a tent.

Dr. Goodell¹ of Philadelphia has been foremost among the advocates of this method of dilatation. In a large experience with extreme dilatation under ether he has had no fatal result and no serious inflammatory disturbance. He carries the dilatation to three-fourths of an inch in the thin-walled, unyielding infantile uterus, and to one and a fourth inches in other instances. In case of a rigid, unyielding, or thin-walled uterus, which might tear from rapid expansion of the dilating blades, it is better to commence dilatation with a sponge or tupelo tent, the softening influence of which renders the canal more easily and thoroughly dilatable by the forcible method.

The dangers are traumatic and septic, the former even to the extent of rupture of the uterus and consequent peritonitis, and death may result from over-distension by rapid dilatation of a rigid uterus. The latter danger is preventible by antiseptics. The special dangers of dilatation by tents, and the impossibility of enforcing thorough antisepsis in their use, have been considered in a previous paragraph. It would, however, be a fatal mistake to suppose that antisepsis deprives dilatation by any method of all its perils. All manipulations of this class, says Fritsch, are dangerous, and not to be employed unless the indication is quite clear. Existing pelvic inflammation, acute or chronic, is a serious contraindication. Indeed, the history of a majority of fatal cases includes previous cellulitis, peritonitis, or metritis. Dilatation, however slight, by any method, should be regarded as a surgical operation, should always be done at the patient's house, never at the office, and should be followed by rest in bed for a time varying from one to seven days. Forcible dilatation either by sounds or by diverging instruments requires an anæsthetic, except when the dilatation is to be slight. If there be tenderness about the uterus or other signs of inflammation, or if the patient has suffered from a previous attack, ice should be kept over the hypogastrium, quinine should be given in full doses, and opium according to the pain until the danger has passed.

The special advantages of each method of dilatation may be summarized as follows:

Incision.—Contraction of the os externum and lower portion of the uterine canal is best treated, according to the nature of the case, either by Fritsch's operation for enlarging the os externum by incision or by Schroeder's operation of bilateral incision of the cervix.

¹ *American Journal of Obstetrics*, 1884, p. 1179.

Tents.—Sponge tents are the most dangerous, tupelo least. Laminaria has but one advantage over tupelo, its flexibility and adaptability to a tortuous canal. In a case of rigid hyperplastic or thin-walled cervix not safely dilatable by rapid means the tent is specially indicated as a means of preparation for rapid dilatation by graduated sounds or diverging instruments.

Graduated Sounds and Diverging Dilators are generally the safest and most effective means of dilatation, and should have the preference unless the softening effect of the tent is specially desired.

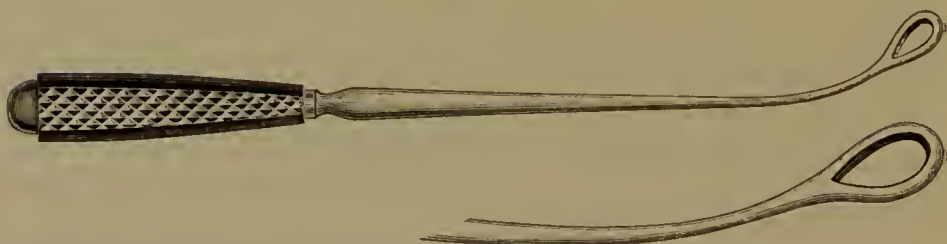
THE CURETTE.

The curette is a spoon-shaped instrument, fenestrated or non-fenestrated, with a dull or sharp cutting edge, which may be introduced into the uterus, with or without previous dilatation, for the purpose of scraping away diseased tissue for diagnostic or remedial purposes. The instrument, first introduced in 1843 by Récamier, has passed through many modifications and received the severest censure, not wholly undeserved, on account of its disastrous results, among which are perforation of the uterus, cellulitis, peritonitis, metritis, and septicæmia.

The indications for the curette are hemorrhage and septicæmia, due to the presence of some intra-uterine cause.

The dull wire curette of Thomas (see Fig. 171) fulfils nearly all the

FIG. 171.



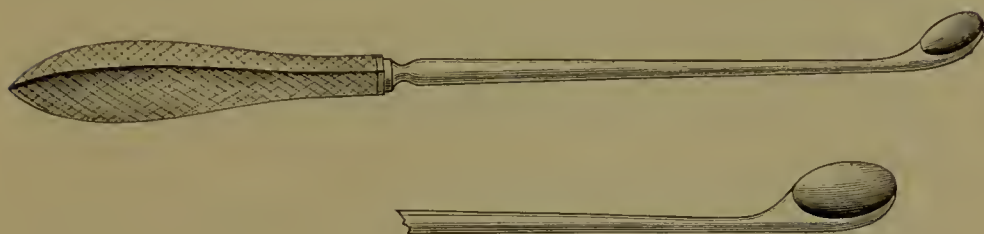
Thomas's Dull Wire Curette.

indications of the instrument, and in suitable cases its use is almost entirely free from danger. It is made of flexible copper wire. The loop at its extremity has slightly flattened but not cutting edges. Its shank may be bent like a probe to conform to the direction of the uterine canal, and whatever the force applied it is not likely to injure the sound tissue, while it easily removes the soft, friable products of hyperplastic endometritis called granulations, or the secundines of an abortion, or soft tumors malignant and benign.

Simon's steel curette (Fig. 172), not fenestrated, or Sims's fenestrated, each of which is provided with a sharp cutting edge, should be reserved for the removal of diseased mucous membrane or of malignant tumors.

which resist the dull instrument. Curettes of various sizes are required according to the amount to be removed and the size of the uterine cavity. The smaller sizes may be introduced and used without previous dilatation. During the operation, which is best performed through

FIG. 172.



Simon's Sharp Steel Curette.

Sims's speculum, the cervix is held by a uterine tenaculum. After all the diseased tissue has been removed the endometrium should be wiped out with absorbent cotton, and then with cotton saturated with Churchill's tincture of iodine. The dangers, contraindications, and precautions are the same as in dilatation of the uterus.

THE VAGINAL TAMPON.

The tampon should fulfil the double object of preventing hemorrhage and of producing such pressure against the upper portion of the vagina as to impede the flow of blood to the uterus. In cases of extreme hemorrhage it often becomes necessary, before placing the tampon, to plug the cervical canal with cotton saturated with tincture of iodine or some other astringent. This cervical tampon should be composed of a single piece of cotton, so that it may be easily removed. The material of the tampon should be cotton made into pledgets about two inches square and half an inch thick, and saturated with a solution of alum and squeezed dry. Its application through Sims's speculum, which for this purpose is almost indispensable, has been well described by Emmet. The following is the substance of his directions: Empty the bladder, place the patient in Sims's position, and introduce the speculum. Remove all clots, smear the vagina thoroughly with vaseline or lard, which renders the canal more distensible and the packing less painful, and tends to retard the flow of blood between the tampon and the vaginal walls; then place a pledget of cotton, freshly dampened with a solution of alum, over the cervix; then roll up a mass and place it in the posterior cul-de-sac, also on each side and in front; cover all this with a flat piece of cotton; then place pledgets around the cervix in a circle, and fill in the centre; press back the cotton from the circumference to the centre with a stout whalebone or wooden stick in the left hand and a pair of dressing-forceps in the right, and as room is

thus gained fill in with more cotton. When the vagina has been well filled press it firmly back with the stick from the anterior wall toward the hollow of the sacrum, and slip the speculum in front of the mass. As the speculum is drawn back by the assistant the space left will extend nearly to the uterus. This is to be filled in the same manner, and the speculum repeatedly withdrawn and replaced in front of the mass, and the remaining space again filled, until the whole canal is firmly packed. No violence should be used, but by going around and around the mass and firmly packing in with the stick and the forceps one small portion after another, the pelvic basin may be almost entirely filled. If the tampon be large, confine the patient in bed and give an anodyne. Should the anodyne fail to give relief, the lower portion of the cotton may be removed. If there be retention of urine, it should be drawn with an elastic male catheter. The tampon should not be left longer than twenty-four hours. Before applying another it is best to wash out the vagina with an antiseptic douche and to relieve the bowels by an enema.

Dr. Frank P. Foster¹ of New York recommends lampwick as an excellent material for the tampon, on account of the ease of its introduction and removal even without a speculum, and on account of its ready absorbability. He says: "When the tampon is to be removed the patient simply makes traction upon the portion of wicking that was left hanging from the vulva, and the mass within the vagina is unwound as the traction proceeds; consequently, no large wad has to pass the vaginal orifice and the extraction of the tampon is painless. Besides the advantage of its greater absorbent property, I find that wicking is better adapted to the easy and rapid performance of such a proceeding as I have described than any of the other substances mentioned, including the roller bandage. Moreover, it is sometimes desirable to tampon the cervical canal, or to introduce a medicinal agent into the uterine canal in such manner as to ensure its prolonged contact with the endometrium. For such purpose an inch or more of the end of the wicking may be stiffened with gelatin, and then, after having been dipped into the liquid to be applied, be introduced into the canal by means of a pair of dressing-forceps. If care is taken not to coat the whole circumference of the wicking with the gelatin, the liquid medicament readily permeates the stiffened wicking, and a considerable quantity of it may thus be introduced within the uterine canal. Enough more wicking is then inserted into the vagina to act as a tampon, and when this is removed the portion originally introduced into the uterus comes out with it."

¹ *New York Medical Journal*, June, 1880.

GENERAL THERAPEUTICS.

By ALEXANDER J. C. SKENE, M.D.,

BROOKLYN, N. Y.

A RATIONAL system of therapeutics is based upon a knowledge of the various morbid states, a clear comprehension of the nature and action of the agents employed in the treatment of disease, and a judicious adaptation of the latter to the relief of the former.

It is presumed that the readers of this work are familiar with diseases in general and the means to be used in their treatment. My task, therefore, is limited to a general consideration of the selection and administration of the most reliable means to be employed in the management of the diseases which come under the care of the gynecologist.

The order in which I intend to discuss the several branches of this subject is to consider very briefly some of the chief points in the management of functional derangements, and then the general and local treatment of the organic diseases of the uterus chiefly.

The derangements of menstruation, classified according to their causes, are malnutrition, morbid innervation, and organic diseases of the nutritive system which give rise to conservative amenorrhœa. Reference may be made also to derangements or absence of the menses due to malformations and diseases of the sexual organs.

In the treatment of all the derangements of the menstruation the one cardinal point must ever be kept in mind—viz. to remove the cause, be it local or general, upon which the derangement of the uterine function depends.

Amenorrhœa and scanty menstruation, so frequently due to anæmia, promptly yield to restorative tonics and proper food. This is one of the best-established facts in therapeutics. Iron is of course the restorative tonic most to be depended upon in the management of anæmia. However, there are some ideas regarding the use of the different preparations and the combinations of iron with other remedies which must be mentioned in this connection.

The muriated tincture of iron is one of the oldest and most reliable of all preparations, and answers in the great majority of cases. It may

be confidently used at all times, except when there is some objection made on the part of the patient or when anæmia is associated with some other disorder which demands attention. Sometimes the remedy disagrees with the patient or she fancies she cannot take it; then some other preparation may be used.

The fastidious will take the tartrate of potassa and iron in wine, and sometimes profit by it, while others will take iron in pill form with great advantage. When the anæmia is accompanied with other morbid states, remedies may be combined with iron to remove these complications. In subjects whose breathing capacity is limited the action of iron will be aided by combining with it chlorate of potassa, which is said to aid in the aëration of the blood. Again, in torpor of the liver muriate of ammonia acts well; hence a good combination for such subjects is the tincture of iron, chlorate of potassa, and the muriate of ammonia.

When there is exhaustion as well as impaired nutrition of the nervous system nerve-tonics should be added to the iron. Strychnia is a favorite remedy, and many of the ready-made tonics of the present time have for their chief ingredients iron and strychnia. This remedy, however, is not a restorative tonic in the true sense of the term. At best it can only arouse the nerve-energies for a time, and hence its use should never be long continued, neither should the doses given in amenorrhœa be large.

There are other nerve-tonics better adapted to the depressed state of the nervous system accompanying the menstrual disorders. The phosphates have long had a reputation in the list of the nerve-tonics, and they should be combined with iron whenever called for. The pyrophosphate of iron was at one time popular, and deservedly so. Among the various preparations of the phosphates, Parrish's compound syrup of phosphates is quite equal, if not greatly superior, to many of the fashionable compounds of the present day. Phosphorus is of course the thing required, but it is difficult to administer. A solution of phosphorus in cod-liver oil, put up in pills, is one of the best ways of giving it, but the odor and taste are so disagreeable that many patients cannot or will not take it.

Some of the cerebro-spinal stimulants act well in the menstrual disorders due to depressed and exhausted states of the nervous system. Belladonna, cannabis indica, and all of this class, when given in doses sufficient to stimulate the nervous system, sometimes appear to act favorably in amenorrhœa and scanty menstruation. In their action they appear to sustain the nervous system when given in small and continued doses. In regard to belladonna, hyoscyamus, and all of that class, they should be given in small doses—very much smaller than recommended in the textbooks. These stimulants act best in those

cases of depression from exhaustion from over-fatigue when associated with imperfect menstruation.

There is a large class of menstrual derangements due to deranged innervation in the form of undue excitement, and not necessarily accompanied with anæmia. A strong impression made upon the nervous system from any cause sufficient to produce shock will arrest the menstrual functions in many cases. So also over-mental excitation from any cause will, if long continued, have the same effect. In all this class of cases nerve-sedatives are indicated—remedies that will give the required sedation without the objectionable effects of such agents as opium and chloral hydrate. These should be in such cases avoided, because this class of patients acquire the habit of taking such nerve-sedatives with extraordinary facility.

The bromides take the highest rank in the management of these cases. In acute cases the bromide of sodium should be given in full doses until all the nervous perturbation is overcome, and when this is accomplished it frequently happens that the menstrual function will be established without further treatment. The use of this remedy should be limited to acute derangement of innervation in women otherwise in good health. Whenever there is general weakness from impaired nutrition the bromides should not be given in large doses nor long continued: enough to procure quiet sleep (if it is possible to do so with bromide) and relieve the nervous excitement is all that is required of this remedy. In such conditions the bromides will often fail and other remedies must be resorted to. A favorite combination of mine is the extracts of valerian, conium, and lupuline with camphor, given in a capsule. This often answers the purpose of a nerve-sedative, giving sleep and a disposition to rest, which affords the patient time and inclination to menstruate. Valerianate of zinc, valerianate of ammonia, monobromide of camphor, bromide of zinc, and like remedies are all of some service in such cases, and should be resorted to when the other means have failed.

The permanganate of potash has recently been introduced by Sydney Ringer of London as an excitant of the menstrual function. I have used this remedy in a number of cases of amenorrhœa, and have derived benefit from it; but I have not had the extraordinary results from it that would enable me to speak in such strong praise of it as many have done. At first I gave it in pill form, and that may have been against its success. But when I gave it in solution it did not always satisfy me. One trouble is to get it into the circulation, it is such an easily decomposed stuff. I have seen recently that oleate of manganese is commended by Dr. Franklin H. Martin in the *Medical Record* for June 27, 1885. The binoxide of manganese has also been used in its place with alleged good results.

The rule is that when all the conditions necessary to menstruation are restored the flow will return. Still, there are cases of amenorrhœa which occur with or without apparent cause, and persist long after the appreciable defects in general health have been overcome. In such cases we seek for remedies that will act directly upon the sexual organs to re-establish their function if entirely absent, or to increase the flow if it is deficient in quantity. The agents generally used for this purpose are sabina, aloes, canlophyllum, myrrha, cimicifuga, tanacetum, cantharides, and guaiac. The action of these remedies is to produce stimulation and irritation of the mucous membrane of the alimentary canal, and it may be presumed that a similar effect, though in a less degree, is produced upon the uterus.

The congestion of the pelvic organs caused by these drugs may act as an exciting cause of menstruation if they are given at a time when there is a predisposition to menstruate and the local and general conditions necessary to menstruation have been established. They are certainly worse than useless when given in cases of amenorrhœa due to any constitutional or local affection, such as anæmia, deranged innervation, and disease of the uterus or ovaries.

There is also great difficulty in estimating the value of the so-called emmenagogues, because of the fact that the menstrual function will recur in the great majority of cases when the causes of the amenorrhœa have been removed. Therefore, when emmenagogues are given and the menstrual flow is established, it is not sufficient proof that the medicines used have produced the results observed. Again, I have observed that in cases of amenorrhœa in which no cause could be discovered the so-called emmenagogues have failed to restore the menses. They are agents which are capable of doing harm by deranging the digestive organs, and hence I very seldom use them; and from all that I can learn of the practice of others, they are not so frequently resorted to as formerly, and there is reason to believe that they will soon fall out of use entirely.

There are other agents which have been used to promote the menstrual flow in cases where the amenorrhœa has remained after the general condition of the patient has been restored to health and the flow has not returned. Of these agents it may be said that they are not likely to do harm, and their recognized general therapeutical action suggests at least the possibility of their being useful. These are the diffusible stimulants, like alcohol, ammonia, camphor, chloric ether, and acetate of ammonia.

There are two conditions in which these remedies are indicated. The first is where the subject has been exposed to cold at the time when the menstrual flow should appear, but does not. We counteract the effects of the cold and equalize the circulation by means of a warm bath, and

then ammonia with camphor, a small dose of warm gin or whiskey punch, or the acetate of ammonia will often give good results. To the other class belong those who have symptoms of a tendency to menstruate—*i. e.* have a menstrual molimen, but the flow does not appear. In such cases the remedies referred to may be employed with advantage. In those of full habit alcohol should be avoided. In such cases the ammonia and camphor will act best.

In all countries where malarial poison prevails deranged menstruation is frequently experienced: the effect of this miasm upon the function of the uterus is manifest in many ways. The anæmia which so frequently occurs in malarial poisoning produces amenorrhœa. The effect of the poison on the nervous system gives a like result. Chronic malarial poisoning, with morbid changes in the abdominal viscera, influences menstruation in a marked degree. Amenorrhœa is observed in these subjects occasionally, but menorrhagia is perhaps more common.

In all cases arising from this common cause quinine and arsenic are the agents to depend upon. In cases of long standing with engorgement of the abdominal viscera and enlargement of the spleen and liver an occasional dose of mercury aids greatly in the treatment. Finally, when all the causes have been removed and the menstrual function is not established, and the means usually employed to restore it have failed, electricity is well worthy of a trial. The interrupted current is said to be the most valuable form of the electric treatment.

General or central faradization may be tried, and if this fails the current should be passed through the pelvis, one electrode being placed over the sacrum and the other over the pubes. The best way of all is to pass one electrode into the uterus and the other over the sacrum and pubes alternately. But this method is seldom practicable in the unmarried.

New impressions from change of surroundings are often of great value in obstinate cases. Change of air gives increased vigor to the nutritive functions, and new subjects of interest and new associations are marked stimulants to the brain and nervous system; all of which favor the highest functional activity of the uterus.

The Constitutional and Local Treatment of Organic Diseases of the Sexual Organs, especially the Uterus.—On this subject there is possibly less harmony of opinion and practice among gynecologists than there is in regard to the foregoing subject. Yet all know very well that local diseases, organic as well as functional, are largely under the control of constitutional medication.

The sexual organs being dependent upon the general nutritive system for support and the general nervous system for innervation, it follows that through this relationship they are dependent in health and disease, and that any marked defect in the general health must act to the injury

of the sexual organs. It is also clearly apparent that to affect the sexual organs with therapeutic agents we must often take the nutritive and nervous systems as the channels through which to reach them.

There are a vast number of ways by which the general organization works to the detriment of the sexual organs, and in the practice of gynecology the general health must at all times be looked after, both in connection with the causation and treatment of uterine and ovarian diseases. It is also well to keep in mind that constitutional remedies reach and act upon the sexual organs through both the nutritive and nervous systems. Owing to this correlationship of the general organization and the sexual system the remedies employed by the gynecologist may be classified as follows: First, remedies which act indirectly upon the sexual organs by modifying the general nutrition; second, remedies which act through the nervous system; third, remedies which act especially upon the sexual organs, either through the circulation or nervous system; fourth, agents used locally which influence morbid states of the sexual organs.

Under the first head may be classed all agents which are capable of improving general nutrition. This embraces a field altogether beyond the scope of this work, and hence I must limit my labors to the consideration of the derangements of nutrition most commonly seen in connection with diseases of the sexual organs, and more especially to those functional disturbances of the nervous system and digestive organs caused by, or at least aggravated by, uterine and ovarian diseases. Prominent among these will be found impaired appetite and constipation. The loss of desire for food or a capricious appetite may be wholly due to derangement of the nervous system, the stomach itself being free from organic disease.

If this functional disturbance exists long, gastric catarrh is likely to come in due time. The former may usually be distinguished by the fact that the appetite is capricious, at times good and at other times poor. The tongue is not always coated, but more often light red and the papillæ prominent. In the latter (catarrh) there is usually a constant loathing or dislike for food, and the tongue has the swollen and coated appearance characteristic of that disease.

In the management of either form of the gastric disorder the quantity and character of food are of primary importance. Full details of the dietetics of this class of cases must be obtained from works on the practice of medicine. A word or two may, however, be admissible.

As a rule, the likes and dislikes of the patient regarding food should be respected, unless in cases where the nervous system is markedly perverted and the fact is manifested by unreasonable capriciousness. In order to get a beginning to improve great advantage may be obtained by using the digested foods. Peptonized milk, gruel, and beef should

be tried. Lately I have been able to nourish some of the most obstinate cases with the preparation known as "Faichild's humanized milk." This is intended for infants, but it has proved of great service in beginning the treatment of many cases of feeble indigestion.

Forced feeding has been greatly in vogue of late, and it has its advantages. The method is to begin by giving small doses of food at short intervals, and increase the quantity regularly until the capacity of taking an abundance is developed. The system is an admirable one, and is especially suited to the cases of gastric neurosis and reflex gastric disorders. It has its limits, however, as there are cases where it seems to be unsatisfactory. As soon as the patient has improved sufficiently in the power of digestion a liberal and varied quantity of food should be given.

The medicinal agents to be employed to aid digestion and create an appetite are of two classes—sedative and tonic. Gastric sedatives will quiet irritation and improve the appetite in certain cases. Of these, bismuth, oxalate of cerium, and hydrocyanic acid are the most reliable. The oxalate of cerium should be given in larger doses than the books direct. Five or six grains before meals are a sufficient dose. These remedies should be given half an hour before meals.

The tonics are the vegetable bitters, the preferable ones being columbo, quassia, and cedron. The drachm doses of these bitter tinctures generally given do not act well in the cases under consideration. Such doses contain too much alcohol for irritable stomachs unless largely diluted, and then the quantity is too great. Half a drachm, or even less, in a little warm water is more efficient and acceptable. Two or three drops of nux vomica in a small wineglass of warm water acts well with many. Two drops of wine of ipecac. added to the nux vomica makes a most valuable combination. Four drops of fluid extract of cedron given in water is also of great value in giving an appetite. The bitter is clear, well defined, and passes away very soon, leaving an agreeable taste in the mouth.

Much may be done by a competent nurse who understands how to offer tempting articles of diet.

When food is being taken in fair quantities only half the battle is won in many cases. The digestion may be labored and attended with much distress—in some cases immediately after eating, in others an hour or two after. Much of this may be avoided by giving food that is easily digested. If this fails, the digested foods already referred to should be given. Pepsin helps this labored digestion in certain cases, while in others it is useless. When pepsin alone fails, I have combined with it lactic acid and some aromatic, like tincture of cardamom. This is given after the meal in hot water.

The disagreeable behavior of the stomach is often greatly aggravated

by the state of the bowels. Indeed, many times I observe that when the bowels are made to act properly the stomach, which has been out of order, takes up its duties at once.

Constipation of the bowels is an almost ever-present state in those who have disease of the sexual organs. This is caused either by deranged secretion of the alimentary canal, impaired muscular action, deranged innervation, or all three together. The condition of the tongue and the character of the discharges will show imperfect secretion, and this can best be relieved by beginning with a dose or two of mercury. A dose of blue mass with a grain of ipecac. at night, followed if need be by some gentle laxative, will often give good results. For those who alternate between constipation and diarrhoea a favorite prescription is blue mass, calcined magnesia, aromatic syrup of rhubarb, glycerin, and peppermint-water.

To keep the bowels in order after one or more doses of these alterative cathartics the mineral waters, natural or artificial, will answer well for those whose secretions are retarded. In the use of these there are two rules which ought to be observed: First, to give the water at least one hour before meal-time, the morning being preferable if the patient can take it then; and second, to select by trial the water which suits the case in hand. Practitioners are apt to use some favorite water for all cases, while the rational method is to select from the many the one which gives the desired results in severe cases.

When the constipation is due to muscular and nervous debility, mineral waters and saline laxatives rarely agree well. They cause flatulence, pain, and occasionally nausea. In such conditions tonic laxatives are required. In the use of these there are some rules which should be carefully observed. They should be given in small doses, repeated often enough to give the desired effect and no more, and they should be continued until the habit of constipation is completely broken up, and resumed upon the first indication that the trouble is returning. If the adaptation of the remedies is right, the doses can be gradually diminished in quantity and frequency, in place of having to increase the medicine to get the desired effect.

Belladonna stands at the head of the list of agents in the treatment of constipation occurring in gynecological cases. If given alone in small doses, often repeated, it will answer in some cases. It is of course seldom given alone, but in combination with other laxatives.

Nux vomica is often employed, but it is objectionable. It acts only for the time, and if continued long it loses its effect, requiring a larger dose to be given in order to obtain any effect at all. The most that can be said of it in the management of constipation is that it may be useful at the beginning of the treatment to give the patient a start in the right direction in cases of marked debility.

One of the most reliable combinations that I have found is one grain of sulphate of quinine, one-tenth of a grain of the extract of belladonna, and half a grain of the compound extract of colocynth, made into a pill. One of these given with each meal has helped more cases than any other prescription. As the patient gains strength the number of doses can be reduced to two or one a day, and finally half of a pill every day or every second day.

In cases of amenorrhœa or scanty menstruation the aqueous extract of aloes may be used in place of the colocynth, a quarter of a grain usually being sufficient. When pills are objectionable to the patient, the fluid extract of podophyllum, one or two drops, tincture of colocynth, six drops, and fluid extract of belladonna, one-third of a minim, should be given after meals in a little glycerin and some aromatic which is agreeable, like peppermint-water or cardamom. The compound licorice powder should not be forgotten. A teaspoonful of this preparation, if carefully prepared by being thoroughly pulverized and mixed and given at bed-time, will do well in many cases.

We now come to the consideration of the therapeutic agents which act upon the sexual organs through the ultimate general nutrition. Some of these agents act through the circulation and innervation, modifying the state or quantity of the blood which supplies the sexual organs, thereby affecting their condition and action. The type of this class is ergot. This agent is well known to possess very extraordinary power to excite muscular action in the uterus, but its greatest value is limited to obstetric practice. There it is the most certain and reliable of all medicinal agents in its uniform action under given circumstances. It is far from being so useful in the practice of gynecology. Muscular contraction of the uterus can only be possible when the organ is developed either by gestation or intra-uterine neoplasms; hence ergot is not often efficient in disorders of the uterus.

It has been claimed that ergot, by causing contraction of the muscular walls of the blood-vessels, is valuable in all congested states of the uterus, but, practically, this is not of much account. It is true that the ergot causes contraction of the blood-vessels generally, but in order to make it of much value in local congestions it requires to be given in large doses and long continued, so that long before much benefit could be gained in disease of the uterus its constitutional effects become so marked that it has to be suspended.

Practically, then, its use in gynecology is limited mostly to cases of intra-uterine growths where it is desirable to cause contraction of the uterus in the hope of arresting their growth or expelling them, and in subinvolution of the uterus, where the object is to cause active contraction of the uterus in the hope of stimulating the process of involution.

When the uterus after confinement remains large, soft, and vascular,

ergot does appear to have some effect in condensing the tissues and lessening the congestion. Still, granting all this, ergot is not sufficient alone to complete involution in all cases, but it may be a valuable aid.

Alteratives which favorably influence general nutrition often act indirectly upon diseases of the sexual organs. The principal remedies of this class are mercury, iodine, and arsenic. They are of the most service in overcoming the evil results of the products of bygone inflammations, such as cellulitis and peritonitis, the latter especially. They are perhaps most efficacious in ovarian inflammations of a subacute character. They have been used also in endometritis, but they do not seem to accomplish much in that affection.

To favor the absorption of the products of pelvic cellulitis and peritonitis the bichloride of mercury, combined with iron when necessary, has been commended, and no doubt it is of great service. After using it for a time it may be followed by the iodide of sodium if the general nutrition permits it. The iodide of iron will answer better when iron is indicated.

The selection of these agents should be made according to the condition of the patient of course. When general disintegration is sluggish and there is much flesh, the mercury, followed by iodine, generally is best, and when there is anæmia the iodide of iron should have the preference. To be effectual these remedies should be continued for a long time. A similar course of medication is indicated in old inflammatory diseases of the ovaries and Fallopian tubes.

Chloride of gold has recently been commended in diseases of the ovaries. I presume it should be classed among the alteratives, but I have not seen any effects from it that would warrant my indorsing it, neither have I heard any very reliable records in its favor.

In regard to arsenic, its well-known effects upon the nutrition of the skin and mucous membranes entitle it to consideration in the treatment of obstinate inflammatory diseases of the uterus and Fallopian tubes. It should be given in small doses (two or three drops of Fowler's solution) and continued for a long time. When given in this way it will apparently improve the nutrition of the mucous membrane of the uterus, judging from my observations in the management of cases of obstinate cervical catarrh and membranous dysmenorrhœa.

There is another class of remedies—quite a large one—which act mostly through the nervous system, and upon which the gynecologist greatly relies. This class may be subdivided into nerve-tonics and sedatives. Of those classed as tonics, some may be considered as stimulants by therapeutists, but it will suffice for the present purpose to say that under the head of tonics I shall class all those that temporarily or permanently increase nerve-force. *Nux vomica* is an agent which acts well in cases of marked debility, and is often quite effectual in cases in

which there is general weakness of the nervous system due to uterine or ovarian diseases. It is claimed by some to exert a marked tonic effect upon the sexual organs, and its effect as a general tonic is fully understood. It is only temporary in its effects, however, and if long continued proves injurious. If given for a length of time, it is observed that larger doses are necessary to give the desired effect, and when the medicine is withdrawn a lowering of the nerve-force takes place. In this it resembles in its action the alcoholic stimulants. As a remedy, then, it is only to be used at the beginning of the treatment to sustain the patient until more permanent restoratives have had time to build up the strength. To start the case in the way of improvement is the chief office of this remedy.

Belladonna and agents belonging to that class, when given in small doses at regular intervals, exert a decided tonic influence, especially upon the organic nervous system, while at the same time the effect upon the sexual organs is slightly tonic and sedative. General nutrition is aided by them, and patients will often acquire better spirits and sleep better while taking them.

Hydrobromide of hyosine is a new remedy, which acts in a way similar to belladonna, and is even more efficient. When given in doses of the one-hundredth of a grain, more or less according to the case, it gives an improved tone to the nervous system, improves the capillary circulation, and relieves some of the wandering, ill-defined pains so commonly associated with diseases of the uterus and ovaries.

Zinc and phosphorus represent the class of nerve-tonics which aid in restoring the nervous system to a better state, and it may be said of all these that so far as they improve the general system, just so far do they aid in relieving diseases of the sexual organs.

Quinine is an agent worthy of the special attention of the gynecologist. It is well known that quinine will stimulate uterine contractions during labor in case the nervous system becomes exhausted, and presumably it may improve local innervation in disease. It is also a valuable remedy in cases of neuralgic pains in the pelvis. In view of these facts it is reasonable to suppose that its action upon the pelvic organs may be more than that of the ordinary tonics. At any rate, as a general tonic it ranks among the highest in the management of uterine and ovarian diseases.

Electricity has been more urgently commended perhaps than any other agent in the practice of gynecology. After carefully examining the testimony given in our literature, and making such clinical observations as I could regarding electricity, I have come to the conclusion that when used generally it is capable of improving nutrition, and in some cases it quiets nervous irritation, and the sexual organs come in for their share of the general improvement; but general faradization

or galvanization has no direct or specific effect when used in this way. Regarding the local effects of electricity something will be said farther on.

Sedatives are so frequently called for in the practice of gynecology that the subject requires its full share of attention. In view of the suffering of those who have diseases of the sexual organs, the practitioner naturally turns to opium as the most potent remedy, but in this branch of practice it is often the most disastrous in the ultimate results of its use.

In acute disease, like pelvic peritonitis and ovaritis, opium is the remedy of most value, but in the less acute affections it is seldom curative and nearly always dangerous—dangerous because of the great facility with which this class of patients acquire the opium habit. No remedy can be more gratifying to both patient and physician in its immediate results; but it relieves only, does not cure in many cases, and therefore should not be used when it can be avoided.

A similar though less severe verdict may be rendered in regard to alcoholic stimulants. These are seldom well borne by patients with diseases of the pelvic organs, and hence there is less danger in prescribing them, because there is less likelihood of patients acquiring an abnormal desire for them.

Chloral hydrate may be mentioned in this connection, only to suggest caution regarding its use by the gynecologist. The most that it can do is to produce sleep. It does not in small doses relieve pain as opium does, and, more than that, chloral is more liable to produce irritation of the sexual organs than opium. Several patients who have tried opium and chloral to ease their sufferings have told me that chloral caused sexual excitation, while opium subdued it.

Bromide of sodium is the great sedative in the practice of the gynecologist. It not only relieves much of the suffering, but it has, through its sedative effect, a curative influence in many of the diseases of the sexual organs. By relieving the nervous excitation and irritability it lessens the congestion of the pelvic organs, and hence tends to relieve many of the inflammatory diseases and functional derangements. There are two ways of using bromides, according to the effect desired—the one to break up nervous symptoms, the other to induce sleep. Full doses, repeated until the specific effects are produced, should be given when the object is to break up a train of nervous symptoms due to disease of the pelvic organs. When this is accomplished the patient will generally emerge from the effects of the bromide in a quieter and better condition to respond to the general restorative treatment.

In some of the weak, nervous cases one may be at times afraid to push the bromides very far, for fear that the prostrating effects might prove dangerous. Caution in this is wise and necessary, and yet the

patient must be brought under the remedy to get the full benefit. To accomplish the good and avoid the danger small doses of *nux vomica* should be combined with the bromide. *Digitalis* also may be added if the heart-action is weak.

While advocating the liberal use of bromide I would say that it should not be long continued. I rarely give this drug longer than a week or two, except it may be one dose in the afternoon and evening to prolong the night's sleep.

When bromide is not well borne or does not give the desired effect, *cannabis indica* may be tried. *Conium* also does well, and may be combined with camphor, *eroton chloral*, *lupulin*, *belladonna*, *asafoetida*, and castor, but they all may be considered as substitutes to be used in rare cases when the bromides fail.

Next to the bromides among nerve-sedatives, and perhaps first among them, is massage. The introduction of this treatment into rational therapeutics was a most valuable contribution. It is employed usually to aid nutrition, and for this purpose it is of great benefit, but it is an excellent nerve-sedative. A skilful nurse can by systematic manipulation soothe the tegumentary nerves and produce that normal tiredness which invites rest and sleep. That which used to be the property of ignorant and designing magnetic rubbers is now modified and adapted to rational use. It is a "stone which the builders rejected" for a time, but now fills an important place in therapeutics.

This massage is true passive exercise, the only way that exercise can be given without exhausting or taxing the nerve-centres. By this means the muscular system can be toned down to the condition adapted to normal rest, and a like effect appears to be produced upon the spinal nerves. This therapeutic agent is of so much importance that reference will be again made to it as we proceed. This part of the subject would be incomplete without mentioning electricity. That this agent is useful most practitioners will acknowledge. In my own practice I have not been satisfied that it accomplishes much, excepting in a certain class of cases.

Those who suffer from functional derangements of the sexual organs and nervous system because of imperfect development or misdirected and unoccupied nerve-energies—in short, spoiled girls and women—require a very different course of treatment from those who suffer from more definite diseases. The great object is to find mental and physical employment for them which will turn their attention away from themselves. Here also isolation is an important factor, but it is not for the sake of rest, but change of occupation.

To remove such cases from the influence of kind but unwise friends, and place them in the more wholesome society of a nurse and physician, is a great gain. And then their whole time should be profitably occu-

ped. A portion of the day should be devoted to the Turkish or Roman bath, and if there is a well-defined hysterical element present, the cold pack, shower-bath, and needle-bath may all be tried in turn. In the external use of water the rule is warm water for the weak and nervous, and cold water for the strong and hysterical.

Gymnastic exercise, adapted to the condition of each patient, is one of the most valuable means in the management of such cases, and should come in after strength has been gained by massage. If there is any pelvic disease which forbids the use of the ordinary calisthenics, the extremities should be thoroughly exercised while the patient is reclining. There is no one agent so potent in relieving chronic congestion of the internal organs as muscular exercise. It is equally efficient in quieting that nervous irritability which is expressed in the hosts of wandering aches and pains which torment this class of patients.

The condition of a brain which has for a long time been wholly occupied in looking after the frailties of the body can be greatly improved by directing the will-power to the exercise of the muscles. I frequently see women who because of some uterine displacement or circumscribed pelvic cellulitis are directed to rest in bed without any mental or physical employment. Such imprisonment is sufficient to make an invalid of the best kind of human material. To keep an army in good condition requires constant occupation of both officers and men, and this rule applies to many of our sick folks. Our medical literature could well afford to have a chapter on Employment for Invalids.

After muscular exercise, electricity comes in to fill up time, and is useful to that extent at least. Patients who have some hysterical elements associated with these diseases of their pelvic organs are usually most benefited by electricity. So says Rosenthal in his book on *Diseases of the Nervous System*, and my own limited experience agrees with this. Some of them, perhaps many of them, are feeble and require medication. Soothing medicines and nerve-tonics may all be required, and should be employed while the massage, gymnastics, and baths are being used.

The local treatment of the diseases of the uterus, the one organ of the sexual system which is most amenable to local treatment, will be fully discussed elsewhere. Some general remarks, however, on the principal facts in uterine therapeutics may be permitted in this connection.

Local treatment of diseases of the uterus should be employed with the view of accomplishing two objects: First, to remove the disease; and second, to restore the organ to its normal condition. It will at once be inferred that if the first object is attained the second will follow as a natural consequence, but it may or may not, according to the cha-

raacter of the treatment employed. I am satisfied that in times past, and even at present, much of the treatment of uterine disease, while it arrests the inflammatory trouble, proves so destructive to the normal structure of the organ as to render the last condition of the patient worse than the first.

Disregarding much of the confusing and contradictory literature on the subject, I shall endeavor to fix attention upon a few points which I regard as well established and likely to be of service in the treatment of uterine disease.

The important questions which come up for consideration on this subject are—first, to what part of the affected organs can applications be made? second, what curative agents shall be employed? and third, how shall they be applied?

Turning to textbooks or the current literature of the profession in search of an answer to the first question, I find the greatest diversity of opinions. The pioneer gynecologists of Europe, such as M. Gendrin, M. Jobert de Lamballe, Bennet, and Simpson, rarely if ever made applications beyond the os internum, believing that uterine inflammation could be cured by treating the cervix and cervical canal. On the other hand, we find that Aran, Scanzoni, and Gantillon, and in our own country Dr. Henry Miller (who, by the way, was the first to employ intra-uterine medication in this country), Kammerer, Nott, Peaslee, and many others, relied to a very great extent on intra-uterine applications for the relief of endometritis and uterine catarrh. Many more names might be mentioned to show the want of harmony among physicians on this point, but no useful knowledge could be gained thereby.

The only point of interest which we can learn from this review is that, so far as we can judge, intra-uterine medication is more extensively employed now than formerly. Believing, then, that time tends to drift us to the side of correct therapeutics, it may be inferred that local applications to a part or to the entire lining membrane of the uterine cavity are sometimes necessary, if not indispensable, in treating endometritis.

In seeking an answer to the second question we encounter a variety of medicinal agents, ranging from the actual cautery to the blandest anodyne lotion. Reviewing the nature and effects of the various remedies used in the treatment of uterine disease, we could in no way be guided thereby in making a selection.

Bearing in mind, however, the second object to be gained—namely, to restore the organ to health and leave it uninjured in structure—the therapist is bound at once to reject all the more powerful and destructive agents, such as nitric acid and chromic acid, caustic potash, and the actual cautery. All these have been used, and are now, though less extensively, I trust, than formerly, in the treatment of simple

chronic endometritis or hyperæmia of the mucous membrane of the cavity of the uterus.

Leaving out of account the value of these potent agents in the treatment of malignant diseases of the uterus, I desire to be distinctly understood as opposed to their use in the treatment of the benign uterine disease. I readily admit that inflammation of a mucous membrane can and may have been "cured," as the expression is, by such means. The surgeon can "cure" a gleet by burning out the whole mucous membrane of the urethra with caustics. There would be nothing left there but a cicatrix, which could not secrete the glairy mucous discharge of gleet; but most men, I am inclined to think, would prefer the disease to such treatment with such results. The oculist could "cure" a chronic conjunctivitis in the same way, but I fear the eye would be hardly presentable afterward, and it would surely fail to perform its function. Still, there are those who treat the same affection of the mucous membrane of the uterus with these destructive agents, and the results which follow can be easily imagined. It may be argued, I am aware, that strong caustics are being used less and less by the profession in the treatment of uterine disease, and I am glad to believe that such is the case. The nitric and chromic acids and other caustics are being laid aside, but only, I fear, to give place in some cases to new but none the less destructive agents: I allude to galvano-cautery and thermo-cautery. These have become the "fashionable" caustics or canteries of the day, and I most thoroughly appreciate their value in the treatment of malignant disease when the destruction of tissue is called for. But in the treatment of benign inflammation they cannot fail to work a great and uncalled-for destruction, like the other agents used in the past.

In the management of uterine diseases one may be guided by some of the generally accepted rules laid down by surgeons for the treatment of inflammation generally—viz.: place the diseased organ at rest, quiet irritation by sedatives, and relieve the congestion by depletion, astringents, alteratives, and sedatives. To accomplish these objects we must employ all the improved means brought forward by modern investigation, changing and adapting them so as to meet the peculiarities of each case. First, then, secure rest by having the patient abstain from long-continued standing or walking and from over-excitement of the sexual function. If the uterus is displaced, replace it, and sustain it in its normal position by the support of a well-fitting pessary if need be.

To relieve pain and quiet the irritation a vaginal or rectal suppository made of extract of belladonna, one-eighth to one-half grain, with cocoa-butter, used at bedtime, will often give great relief. Suppositories of iodoform and of conium are also of service when used in the same way.

I desire to call attention specially to the next agent—namely, depletion—because I regard it as a remedy of some value. In making this statement I am aware that I encounter much professional prejudice. Bloodletting has ceased to be the fashion of the day. The lancet is condemned as a “little instrument of mighty mischief.” Few of the younger members of the profession have ever seen a patient bled. Local depletion held its own some time after general venesection was to a great extent abandoned, but even this has gradually given way to the popular prejudice of the day. Nevertheless, the fact in surgical therapeutics remains true as ever, that the removal of blood directly from the vessels of an inflamed or congested organ gives some temporary relief.

Frequent repetition of bloodletting should be avoided, but when a case is first seen in which there is marked congestion the abstraction of a little blood by a few punctures around the os externum, or the superficial scarification of the mucous membrane about the external os, will pave the way to other applications. To practise depletion exclusively and persistently, as some of the older gynecologists did, is certainly injurious, but as a means to be employed in suitable cases it is worthy of consideration.

Hot water used as a vaginal douche is an antiphlogistic of much value. It depletes the parts by stimulating the circulation, and is withal something of a local sedative. It is an exceedingly popular remedy at the present time, and is used rather indiscriminately in all diseases of the pelvic organs and with heroic persistency. If properly used, it gives relief in congestion of the vagina and uterus, and in cellulitis when the inflammation is limited to the cellular tissue about the cervix uteri. It is also of service in the passive congestion which often accompanies imperfect involution, but in pelvic peritonitis, salpingitis, and ovaritis it is often harmful.

The most effectual way of using the hot-water douche is to place the patient on her back over a bed-pan and use a fountain syringe. The reservoir should be elevated enough to give the required force to the stream. The vaginal tube should be perforated on the sides near the end, but the extreme end should be closed. This will guard against forcing water into the uterus. The temperature of the water may range from 95° to 110° F., the higher temperature being used only when agreeable to the patient. The quantity to be used may be from one to two gallons. When too large a quantity at a high temperature is used at the beginning of treatment, it sometimes causes faintness. It is well, then, to begin at a lower temperature, and gradually increase the quantity as the patient gets used to it. It is also very liable to do harm when used, as it often is, after plastic operations about the cervix uteri and perineum.

Another means of depletion was introduced by J. Marion Sims. He used a small vaginal tampon of cotton saturated with glycerin, which caused free exosmosis from the mucous membrane, thereby relieving capillary engorgement and œdema.

Position has much influence in modifying the circulation in the pelvis, and hence patients should avoid the too common habit of sitting all day in a chair because they suffer when they walk. Short periods of walking or riding, followed by rest in the recumbent position, should be directed.

When from long-continued congestion the mucous membrane of the cavity of the uterus has become hypertrophied, giving rise to that condition known now as endometritis polyposa, the use of the curette gives the most prompt relief. The blunt instrument should always be used, because it is perfectly effective and free from danger. Dilatation of the cervix with tents as a preliminary to the use of the curette should be avoided. No such dilatation is needed, as a rule. When the mucous membrane is hypertrophied, the canal of the cervix is usually sufficiently dilated to admit a curette large enough to do the work. By carefully adhering to this rule of practice the pain and danger from the use of the tents are avoided, which are great advantages to the patient. In the great majority of cases of corporeal endometritis with thickening of the mucous membrane the use of the curette gives prompt and permanent relief. Still, there are some who may require other local treatment.

There is so much risk in treating the mucous membrane of the cavity of the body of the uterus that there are certain precautions which should be kept in mind. The principal rules for guidance may be formulated as follows: That intra-uterine applications should not be used until other means have been thoroughly tried and have failed; the uterus should be in or near its normal position; the cervix uteri should be sufficiently dilated to allow the fluid to escape from the cavity of the body; such an instrument should be used as will aid in effecting a free reflux or regurgitation.

After having carefully freed the cervical canal from the secretion, the easiest and most effectual way of making applications is to use a glass pipette with a small rubber bulb at one end, the other end being curved like a uterine sound. The solution to be used is drawn up into the glass tube by the rubber bulb; the instrument is then passed up to the os internum or to the fundus uteri if desired, and as it is withdrawn pressure upon the bulb forces out the solution and brings it in contact with the entire lining of the canal. The method generally in use, of dipping a probe wrapped in cotton into the solution, and passing that up into the canal, is very unsatisfactory. The cotton on the probe injures the mucous membrane, and the solution is deposited about the

os externum, very little if any getting up into the canal. The injection or instillation should be made very slowly, because the uterus will not tolerate distension.

The blandest fluid ought to be tried first, in order to test the tolerance of the uterus; a little warm water with table-salt I have found agreeable; perhaps cocaine would be the best; and no agent whatever should be used which might permanently injure the mucous membrane.

In most cases the canal of the cervix is sufficiently open to permit intra-uterine applications, but it may be necessary to produce dilatation as a preliminary step. When such is the case the use of the uterine dilator will answer.

The treatment of the cervical canal is fortunately simpler, being more easy to reach and much more tolerant of irritation. The only difficulty in the way of making applications is the tenacious secretion which fills the canal. This should be removed with a small curette before making the application.

Regarding the agents to be used in cervix or body a long list might be given. It will suffice to say that the safest and most efficient are mild solutions of sulphate of zinc, chloride of zinc, nitrate of silver, tannic acid, tincture of iodine, and carbolic acid, my own preference for general use being tincture of iodine two parts and carbolic acid one part. The frequency with which these local applications should be made depends upon the nature of the lesions. In ordinary cervical and corporeal endometritis once every five or six days will suffice. This gives time for the tissues to fully profit by the application made before it is repeated.

I am aware that the practice with some is to make local applications every day or every other day, but I know that this constant manipulating is irritating and does more harm than good.

Cocaine, the therapeutical action of which has recently been discovered, is a most valuable addition to the materia medica. The gynecologist has long felt the need of some agent that would, when applied locally, act as an anæsthetic, and cocaine has largely supplied the much-needed agent. Its chief value is in rendering the parts to which it is applied less sensitive during the application of curative agents which are necessarily painful. Cocaine lessens the blood-supply in the parts to which it is applied, at the same time that it benumbs them, and on that account it was hoped that cocaine would be a valuable remedy in inflammatory affections. It appears, however, that its effects are very temporary, and it remains to be seen how efficacious it may be in this respect.

It has also been used as a local anæsthetic while performing plastic operations upon the pelvic organs. In this it has proved to be too superficial in its action to control the pain caused by wounding the deeper

nerves. Perhaps by using it hypodermically or applying it to the exposed parts as the operation progresses it may prove of yet greater capabilities. So far, I have found it very useful in relieving tenderness of the vulva, which makes examinations of the pelvic organs by touch and speculum otherwise impossible.

It also relieves the painful urination of urethritis, and also the pain caused by injections in this affection if used frequently. It also benumbs the mucous membrane of the cervical canal, so that the uterine sound or dilator can be used in sensitive cases without the usual pain. Possibly, it may relieve the sensitiveness of the corporeal mucous membrane, thereby rendering intra-uterine medication less painful and dangerous. But this has yet to be demonstrated.

To carry out a systematic course of treatment, such as has been briefly referred to here, is difficult in general practice. Granting that one has the requisite medical and surgical knowledge, it is difficult to obtain the means necessary. In private life proper nursing is hard to obtain. There are few who can afford a well-trained nurse for any length of time, and if that obstacle be overcome the constant interference of relatives and friends thwarts the efforts of both physician and nurse to obtain and keep complete control of the patient. This throws extra care upon the physician or surgeon, and limits the number of cases that one can take charge of. In view of these facts it may be concluded that one can treat a larger number of cases in an institution especially arranged for that purpose with more ease and satisfaction than in private practice.

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